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## FISCAL POLICY AND FISCAL PREFERENCE (1)

By

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### 1. Introduction

If the government budget is deliberately unbalanced for the accomplishment of macroeconomic objectives, how should the deficit or surplus be created? Despite their recognition of the problem, the standard public-finance textbooks do not examine the criteria for this choice in specific detail. For the most part, primary emphasis is placed on discussing the mechanics of the alternatives. Some leading fiscal economists have recently urged that budget unbalancing should be implemented through shifting tax rates. The early Keynesians argued strongly for a concentration on shifting rates of government spending.

The Keynesian and post-Keynesian argument for deficit creation via the expenditure side of the budget was based on the allegedly greater leverage effects of this policy. As compared with tax-rate changes, comparable shifts in expenditure will exert a somewhat larger multiplier effect on total spending in the economy. This result stems basically from the simple arithmetic of the income multiplier. Its importance for actual policy choice is reduced by the recognition that the differential leverage can always be offset by quantitatively-larger tax-side adjustments. Early discussion stressed the disadvantages of expenditure adjustments due to time lags between policy action, implementation, and project completion. More modern discussion has included the differential institutional rigidities on the two sides in the American political structure.

Those who have argued for primary reliance on tax-rate changes suggest the desirability of making basic expenditure decisions independently of the macroeconomic state of the economy. Spending programs that are independently evaluated to be efficient should be initiated regardless of the position of critical macro-economic variables, and programs that are not efficient should not be instituted

merely because there exists some temporary deficiency in aggregate demand to be made up via fiscal-monetary policy. The weaknesses in this general argument have been noted by careful theorists, but, to my knowledge, the precise analysis has not been developed, either within an essentially organic or within an individualistic-democratic reference system. (2) This analysis is limited to the second of these.

## 2. The Assumptions

I shall examine the question in a model of individual behavior in fiscal choice. This model has, to my knowledge, never been applied to the tax-expenditure fiscal policy alternatives, despite its apparent relevance and applicability. Some preliminary simplifying assumptions can be made at the outset.

It is assumed that overall macroeconomic policy dictates the maintenance of aggregate demand at some specific absolute level or growth in aggregate demand at some steady rate through time. Furthermore, this objective is to be accomplished exclusively through the introduction and withdrawal of funds through budget deficits and surpluses. Deficits, when and if these are created, are financed wholly by currency issue. Surpluses, when and if these are created, are disposed of by the destruction of currency. There are no non-fiscal means whereby the supply of money in the economy can be modified. Only one public good is provided, and this good is financed by a tax institution that imposes an invariant tax-price on each taxpayer. Note that this assumption is not so restrictive as it might initially appear to be; many modern institutions, for example, a proportional income tax or a progressive tax with constant share progression over varying budgets, will qualify. The purpose of this assumption is to allow us to examine individual "purchases" of public goods in a model that is, in some respects, analogous to the ordinary market purchases of private and divisible goods.

I shall assume that the policy in question is fully successful in achieving the objectives desired. Aggregate demand in the economy is maintained at the target level or grows at the target rate as a result of the policy combination that is adopted, regardless of the choice of instruments.

Attention will be concentrated on the fiscal choice behavior of a single reference individual. Despite this concentration, it is necessary that the analysis retain some relevance for group outcomes.

To cross this bridge, it is possible to assume that the individual whose decisions we examine is the "median preference" person in the whole community or political group. This becomes helpful when we add the further assumption that collective-community decisions are made as a result of simply majority voting. The quantity of public good to be collectively supplied is determined by the application of simple majority voting rules. In this case, when the preferences of individuals are single-peaked, as they tend to be with an economic choice of the sort treated here, the reference individual's preferences become controlling for the whole community. (3)

### 3. The Analysis

Initially, the budget is balanced and national income is being maintained or growing at its desired rate. The situation confronting the individual is shown in Figure 1. The curve, D, represents his demand or marginal evaluation curve for the public good. (In deriving this curve, income effects are neglected). The tax-price which the individual confronts is shown by OP. This is the "cost per unit" at which the public good is available to him. He will tend to "vote for" the quantity, OX, at this tax-price, OP, provided only that he is allowed to vote incrementally and that he is not forced to make all-or-none choices. Through our assumption of the controlling influence of the median-preference person in majority-voting models, the individual is in equilibrium with respect to his preferred "purchases" of the public good. He does not desire either a larger budget, with more units of the public good, or a smaller budget, with fewer units. Total tax collections from this individual are shown by the rectangle, OXEP, and total public outlay, again measured in units partitioned among all individuals, is also represented by the rectangle, OXEP.

This pattern of reaction will be generated so long as the individual finds his estimated marginal tax-price below his marginal evaluation of the public good. Note particularly in this connection that the marginal tax-price need have little, if any, connection with the individual's marginal tax rate. The latter relates incremental tax payments to some tax base, presumably income, whereas the former relates incremental tax payments to the quantity of public goods supplied, that is, to the size of the budgetary outlay. Even if a tax reduction should fail to reduce the marginal tax rate on income, the individual might still treat this reduction as a reduction in the marginal tax-price, the rate at which he is enabled to "purchase" units of the public good through collective processes.

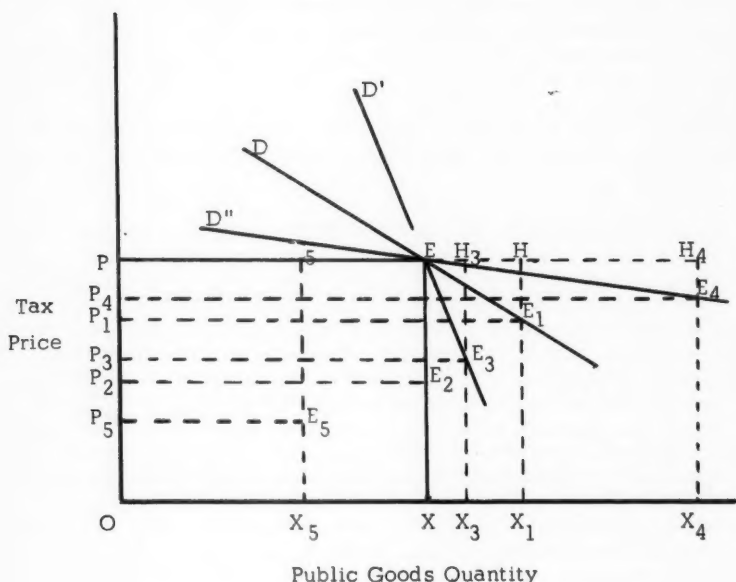


Figure 1

Conceptually, it is possible that the individual might treat any tax-rate reduction as an inframarginal rather than as a marginal shift downward in tax-price. This model does not seem realistic, however, when the complexities of converting tax obligations into tax-prices are recognized. At best, the individual can make some sort of crude estimate for the terms-of-trade with the fisc at the initial and at the post-reduction positions. His reaction behavior will probably be based on some gross estimates subject to wide ranges of error. It seems highly unlikely that he would try to take into account possible variations in tax-price over various quantities of public good, even should the tax-rate changes impose this result in reality. And, as noted, general tax-rate reductions will not normally generate this as a specific result, especially for the median or representative person in the community.

We now postulate a change in habits with respect to the holding of the monetary unit. As a result of a wave of net hoarding, or a threatened and predicted wave, aggregate demand in the economy will fall in the absence of offsetting fiscal policy action. This prediction, which we assume is certain, sets in motion the fiscal policy program previously outlined. A deficit will be created, and in sufficient volume to restore national income to its target level regardless of the instrument to be employed. But how is this deficit to be created? Which way of creation is the more desirable in this model of individual fiscal choice? It is relatively easy to show that if the fiscal preferences of the individual are to remain satisfied, the method of introducing this deficit depends critically on the tax-price elasticity of demand for the public good.

Regardless of the way in which it is introduced, the creation of a budget deficit must reduce the tax-price at which the public good is made available to the individual. If the government simply expands outlay and collects the same tax yields, the tax-price at which the individual "purchases" units of public good is lowered. If, on the other hand, the government reduces its tax yield, while leaving public outlay unchanged, the same quantity of public good is supplied at a smaller total tax outlay; the tax-price is lowered as before. The question is which of these two methods, or which combination of the two "should" be adopted, if the fiscal preferences of the individual are to be taken into account?

Let us first suppose that the expenditure-expansion method is adopted. Tax revenues are unchanged; the government continues to collect taxes at the same rates as before the predicted decline in aggregate demand. Public outlay on the collective good is expanded by an amount sufficient to maintain demand at its target level. From the construction of Figure 1, it can be seen that this method will be fully consistent with the continued satisfaction of individual fiscal preference only if the demand for the public good is characterized by unitary elasticity over the relevant range. The construction is so drawn that the rectangle,  $OX_1E_1P_1$ , is equal in area to the rectangle,  $OXEP$ . Hence, the revenue collected from the individual is the same in the two situations. Tax-price falls to  $P_1$ , and the quantity of the public good increases to,  $X_1$ . The deficit is,  $P_1E_1HP$ , which we have assumed is precisely sufficient to secure target levels of aggregate demand.

Let us now examine the opposite extreme in policy action. Spending is maintained at constant rates, while tax collections are reduced sufficiently to offset the threatened decline in aggregate demand. In terms of Figure 1, the same quantity,  $OX$ , of the public

good is supplied, but the tax-price faced by the individual is lowered to  $P_2$ , the budget deficit now being,  $P_2E_2EP$ . It is evident that this policy will violate individual fiscal preferences unless the tax-price elasticity of demand for the public good is zero. The individual is prevented, by this policy, from "purchasing" more units of the good despite the fact that the tax-price has been reduced.

A third alternative involves the creation of the deficit through both decreasing tax collections and increasing public outlay. For this method to be consistent with individual fiscal preferences, the tax-price elasticity of demand must be less than unitary. This is illustrated by the demand curve,  $D'$ , drawn so as to pass through the initial equilibrium point,  $E$ . The rectangle,  $OX_3E_3P_3$ , is smaller than the rectangle,  $OXEP$ . Tax payments made to the government by the reference individual have fallen. The deficit is now,  $P_3E_3H_3P$ ; the quantity of public good is now  $OX_3$ .

A fourth case is that which involves increasing public outlay and also increasing tax collections, but by less than outlay increases. To be fully consistent with individual preferences here, the tax-price elasticity of demand must be greater than unity over the relevant range. This is shown by the demand curve,  $D''$ , also drawn to pass through  $E$ . The rectangle,  $OX_4E_4P_4$ , is larger than  $OXEP$ ; tax payments made by the individual exceed those made in the initial equilibrium. The deficit here is,  $P_4E_4H_4P$ ; public outlay has expanded by the amount,  $XX_4H_4E$ , and the quantity of the public good has increased to  $OX_4$ .

For analytical completeness, the fifth possible combination should be mentioned, that in which the deficit is created by reducing public outlay and by reducing tax collections by a relatively larger amount. It seems clear that this set of policy actions could not be made consistent with any reasonable assumption about individual demands for public goods. In Figure 1, this combination can be depicted by a shifting to a public-goods quantity, say,  $OX_5$ , a total outlay of  $OX_5H_5P$ , and a tax collection of  $OX_5E_5P_5$ . Here the individual "purchases" fewer units of the public good despite the lowered tax-price.

The conclusions of this analysis stem solely from the relative price effects that the deficit creation produces under the different policy mixes. Since it is postulated that, in carrying out the overall fiscal policy measure, aggregate demand attains desired target levels, the representative individual's income in the post-policy equilibrium will be identical to that in the initial equilibrium. No income effects arise to confound the analysis. The conditions of

individual fiscal choice are modified. Fiscal policy, which can only be operated by the insertion of a wedge between the costs of the public good to government and the payments made for this good by individual taxpayers, necessarily reduces the tax-price that the individual taxpayer-beneficiary confronts. From this point it follows that, if individual preferences are to be met, the method of creating the deficit depends on the elasticity of demand for the public good over the relevant range. It may be objected here that the individual demand for public goods may not remain unchanged before and after the presumed wave of net hoarding which sets off the fiscal action in the first instance. This objection would be critical only if some direction of shift in the demand for public goods could be shown to accompany the shifts in demand for private goods that make the policy action necessary. If no such relationship can be traced, meaningful analysis can proceed on the assumption that there need be no necessary accompanying shift in individual behavior in demanding public goods.

#### 4. The Implications

The analysis does not suggest that fiscal policy action either "should" or, in the real world "would", tend to satisfy the fiscal preferences of citizens. It is interesting, however, to examine some of the implications of failure to meet such preferences, implications that lend themselves to conceptual if not to empirical refutation. Suppose that a deficit is created by reducing tax collections while keeping spending rates unchanged, roughly comparable to the 1964 pattern in the United States. What should have been observed as a result? At the new tax-price for the public good, at  $E_2$  on Figure 1, the individual finds himself off his demand curve. He will, at this tax-price, seek to "purchase" additional units. He cannot, of course, do this independently. He will tend to behave in the political process in such a way that pressures toward expanded public spending will be generated. When given the opportunity, the individual will now "vote for" expansions in the budgetary outlay. Under conditions such as these, there will surely be a tendency for democratic process to overexpand the required fiscal policy action, to exceed the macroeconomic objectives laid down in the program. This situation embodies the paradox that tax-yield reduction, unless the conditions of demand are quite abnormal, becomes the very device for generating the loudest clamor for expanded public spending. Again the post-1964 experience surely bears out the simple predictions. Federal budgetary outlay increased rapidly, and there seems to be general agreement that, by late 1965,

the total effect was overly expansive.

The situation would be reversed, of course, if the policy action should be based in the assumption that, say,  $D''$ , were the appropriate demand curve, whereas either  $D$  or  $D'$  should be more descriptive. Here, after the policy action, the individual might find himself at  $E_4$ , again off his demand curve. In this case, he would bring pressure for a cutback in budgetary outlay. Aggregate spending would tend to be reduced, and the macroeconomic objective may be undermined by democratic process.

The analysis suggests that, in any instance where individual fiscal preferences are not satisfied, within reasonable limits, some pressures toward budgetary changes will be likely to arise. These will be generated, not as a result of the fiscal policy action *per se*, but as a result of the modified fiscal choice position that the change in budgetary policy produces. At the least, the analysis suggests that some attention be given to the conditions of individual demand for public goods when the choice is made among alternative means of creating deficits and surpluses.

The analysis seems fully reversible when applied to the creation of budgetary surpluses. This exercise will not be carried out in this paper. It is, of course, widely recognized that surpluses are unlikely to arise from deliberate policy action in a democratic political setting.

### 5. Alternative Means Of Injecting Money

It should be emphasized that the results obtained in this paper depend critically on the assumption that new money can only be injected into the economy through budget deficits and withdrawn through budget surpluses. This restriction insures that the tax-price of public goods will change, and the desired quantity of public goods will be changed in consequence, under ordinary conditions of demand. It is possible to develop alternative models that allow new money to be injected by non-fiscal policy means. One such method might be the simple random distribution of new bills among the citizenry, wholly unrelated to their purchases of either private goods or public goods. In this instance, ignoring distributional elements, the new equilibrium should not be different from the old in terms of the desired mix between private goods and public goods. It may be argued that only in some such way as this could genuine "neutrality" in macroeconomic policy be guaranteed. Yet another model allows

money to be injected via the private-goods budget. Money could be issued to individuals directly in proportion to their purchases of private goods. In this case, the prices of private goods will fall, while the tax-price for public goods will remain unchanged. This is the converse of the fiscal model examined in this paper, and similar conclusions could be developed. The point to be noted, however, is that this would not be a simple tax-reduction model, as seems to be implied in some of the literature. Tax reduction, in and of itself, reduces the relative prices of public goods, not private goods, and the policy model outlined in this paper becomes relevant. To inject money so that individuals sense a relative reduction in private-goods prices a wedge must, somehow, be inserted between the prices paid by buyers and the prices received by sellers. (4)

It is not the purpose of the analysis here to suggest which method of injecting new money is "best". The purpose is that of showing only that, if orthodox fiscal policy tools are employed, certain specific implications for the manner of creating deficits and surpluses emerge if "political acceptance" of policy action by the citizenry is acknowledged to be a desirable objective.

#### NOTES

1. This paper was developed as an outgrowth of the analysis contained in Chapter 8 of my book, Public Finance in Democratic Process (Chapel Hill: University of North Carolina Press, 1967). In that chapter I tried to examine the effects of modern fiscal policy on individual behavior in political process. In this paper, the analysis is, in one sense, reversed. The emphasis is on the possible effects that the recognition of individual fiscal preferences may exert on fiscal policy norms.
2. The most extensive discussion is provided by R. A. Musgrave. See, his, The Theory of Public Finance (New York: McGraw-Hill, 1959), pp. 517-520. Musgrave argues that primary reliance should be on tax adjustments, not on spending adjustments, in carrying out a positive fiscal policy. In qualifying this argument, however, Musgrave appears to recognize, even if imprecisely, the basic points that are developed in this paper. He is correct when he suggests, in opposition to other scholars, that if national income is effectively maintained as a result of the policy, the issue is not one of income elasticity for public goods. He fails to recognize that the issue does then become one of price elasticity.

3. For the development of the notion of single-peaked preferences, see. Duncan Black, The Theory of Committees and Elections (Cambridge: Cambridge University Press, 1958).
4. To an extent, this is accomplished by a reduction in certain indirect taxes. Implementing fiscal policy by cutting the rates on indirect taxes will reduce the tax-price of public goods, but, in so far as the tax liability is related to the purchase of private goods, the action may also reduce the gross price to which the individual adjusts his private-goods quantities. This suggests that it may well be more "neutral", with respect to the private goods-public goods mix, to inject money through a reduction in indirect than in direct taxation.

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## ETHICS AND GAME THEORY: THE PRISONER'S DILEMMA

By

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After first saying a word about game theory, I shall describe the Prisoner's Dilemma and then go on to consider critically some recent discussions of the dilemma by some of those who take a "moral point of view". In the course of my remarks I shall show that the Prisoner's Dilemma is not, properly speaking, a dilemma (or even a paradox); that neither the generalization argument nor Rousseauian "enforced collusion" offers help in solving this "dilemma"; and that some analyses of suggested analogues to the Prisoner's Dilemma are failures.

The term 'game theory' is generally used to refer to a branch of mathematics dealing with decision-making processes through attempting to simulate mathematically a situation of decision-making so as to discover the most rational decision. (1) (The term 'game theory' might, but should not, be taken to suggest that the scope of the discipline is limited to socially unimportant conflicts such as parlor games.)

As to the overall relevance of game theory to ethics, I shall say no more here than to remark that I agree with J. R. Lucas when he wrote:

The theory of Games is never likely to provide a calculus of Morals; but it may well provide models on which to sharpen our logical teeth and develop our moral sense. (2)

### I

The Prisoner's Dilemma is a 2-person, non-zero-sum, non-cooperative game first devised by A. W. Tucker in the early 1950's, and is usually given the following interpretation: Two persons are thought to be jointly guilty of a serious crime, but the evidence is not adequate to convict them of that crime. The district attorney

separates them and asks each if he would like to confess, saying that if both confess he will recommend a somewhat lighter sentence, e.g., 6 years in prison, than the usual one, e.g., 10 years in prison; but that if both decide not to confess, both will be prosecuted on a minor charge (of which there is conclusive evidence) and each will get 2 years in prison. On the other hand, if one confesses and the other does not, the squealer will get only 1 year in prison and the other will get the full 10 years. The following 2-by-2 matrix diagrams the options:

		Jack	
		Don't Squeal	Squeal
Willy	Don't Squeal	2      2	1      10
	Squeal	10      1	6      6

Figure I  
Prisoner's  
Dilemma

(The lower number in each box gives the years in prison for Willy, the upper number gives the years in prison for Jack) (3)

For Willy the bottom boxes are preferable to the top boxes no matter what Jack does: if Jack does not confess or squeal, it would be in Willy's interest to squeal (a single year is preferable to two years); if Jack does squeal, it would again be in Willy's interest to squeal (6 years are preferable to 10). For Jack the right-side boxes are preferable to the left-side boxes: 1 is preferable to 2 years, and 6 is preferable to 10 years. So if each does the rationally self-interested thing, each will squeal and both end up in the bottom-right-hand box (6, 6).

(Note that even if the Prisoners are put together for a few minutes and permitted to conspire, this will not change matters as long as no binding agreement can be made and they squeal separately and each is interested only in getting the shortest sentence for himself. But should there be communication among the prisoners sufficient to develop friendship so that the individual prisoner becomes concerned with the well being of his fellow, the resulting choice might be different. And experimental sequential runs of the Prisoner's Dilemma give evidence that individuals tend to adopt cooperative behavior even in the absence of explicit communication.) (4)

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Rapoport and Chammah, in their recent book Prisoner's Dilemma (5), write as follows:

The wide interest in Prisoner's Dilemma among both psychologists and game theoreticians is in its status of a genuine dilemma or paradox. It seems to us that this paradox is of the sort that appeared at times on the intellectual horizon as harbingers [sic] of important scientific and philosophical reconstructions. Such has been the Achilles' paradox discovered by the Eleatics. Both paradoxes were precursors of modern mathematical theories of the continuum. Such have also been the logical paradoxes with self-negating propositions as kernels, the precursors of the modern critiques of the foundation of mathematics. The paradoxes of relativity and of quantum physics also initiated a far-reaching philosophical reconstruction. (p. 11)

One might define 'dilemma' rather loosely as follows: a state of affairs in which a choice is demanded but the alternatives appear to be equally bad or undesirable. (6) Is the Prisoner's Dilemma a dilemma? It is hard to see that it is: confessing (squealing) strictly dominates not confessing (not squealing): the consequences of confessing are better for either, no matter what the other fellow does, than are the consequences of not confessing. Now Rapoport and Chammah write that the Prisoner's Dilemma is an "example of a game which has no satisfactory solution. That is to say, whatever choice is recommended by 'rational considerations', has something wrong with it in spite of the fact that nothing remains unknown about the situation. In other words, the chooser cannot do better by finding out more. Hence the dilemma." This seems confused. There is nothing wrong about the rational choice for any prisoner, given the conditions of the game, though of course both prisoners might like to play some other sort of game. The source of confusion, I think, is this: if one compares a situation in which both act "rationally" with a situation in which both act "irrationally" (both choose not to squeal), the latter situation is preferable to the players; this is confused with the Prisoner's Dilemma where no joint choice is possible. It remains true that any individual choice is better if "rational," worse if "irrational," no matter what the other prisoner does.

The prisoners will end up in the upper left-hand box (2, 2) if either a) they are playing the game cooperatively with an enforceable contract and each chooses rationally; or if b) the two players choose irrationally; or if c) the two players choose rationally but both wish to minimize total pain and each evaluates any one year in prison for either as equivalent to any other year. But of course in the first case, there is no Prisoner's Dilemma; in the second, each is ignorant

of the choice which would maximize his own utility; and in the third case we have a choice made by two utilitarians whose hedonic calculus is not the one usually attributed to the prisoners. (One might note that even if one prisoner was a utilitarian who had no knowledge of the "morals" of the other, he would choose not to confess no matter what the other did so long as he operated on the assumption that the disutility of years in prison for either prisoner is effectively linear and assumed that the disutility of one year in prison for either prisoner is equal to that for the other prisoner.) (7)

And one cannot, I think, defend the claim that the Prisoner's Dilemma is a paradox, an assertion seemingly contradictory or opposed to common sense. Rapoport and Chammah write:

In ... the Prisoner's Dilemma, the rational choice of strategy by both players leads to an outcome which is worse for both than if they had chosen their strategy 'irrationally'. [But again, parenthetically, any individual rational choice is preferable to any irrational choice.] The paradox remains unresolved as long as we insist on adhering to the concept of rationality which makes perfect sense in zero-sum games [those games in which the gain of one player from any choice results in an equivalent loss to the other] but which makes questionable sense in non-zero-sum games. Thus, the paradox forces a reexamination of our concept of rational decision. (p. 13, *op. cit.*)

I think it obvious that there are no better grounds for calling the Prisoner's Dilemma a paradox than there are for calling it a dilemma. And I fail to see that in a 2-person non-zero sum game, the "rational" choice is somehow contraindicated or has less prescriptive power. (8)

In some recent discussions of the Prisoner's Dilemma by philosophers, namely those by Wolff, Thompson, and Held (9), statements are made implying that the problem is one of mutual trust. But (as will be pointed out by Gordon Tullock in a forthcoming article in *Ethics*) this is of course not so: one prisoner might be perfectly sure that the other will not confess without making it undesirable for the first to confess. But if one were to go on to say, as Tullock does, that the problem raised by the Prisoner's Dilemma is the "social irrationality" of the individually rational decisions of the prisoners, then one has to explain why, in this little society of the two prisoners, two individually rational decisions lead to social irrationality although two individually irrational decisions lead to social rationality.

I think the short answer to this question is that the game the

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prisoners are asked to play is one which leads to social irrationality so far as the prisoners' little society is concerned but presumably leads to social rationality so far as the larger society, civil society, is concerned. I shall return to this point later.

## II

In a recent article in the Review of Politics, R. F. Hopkins suggests that we apply the "generalization argument" to the Prisoner's Dilemma. (10) Popularly phrased in the form: "But suppose everybody did the same!", the generalization argument calls for appealing to the consequences of everybody's doing  $x$  as the criterion of the rightness of my doing  $x$  (where  $x$  stands for an identifiable kind of act). For example, if I tell you that I don't think I'll bother voting in the next election, you might use the generalization argument to try to show me that I would be wrong in not voting. You say to me: "But suppose everybody did the same, suppose everybody decided not to vote; then the results would be disastrous; and so it would be wrong of you not to vote."

Very briefly and loosely, the answer to one who tells me that my not voting is immoral -- suppose everybody did the same! -- is that I know that not everybody will abstain from voting; and that since there is no causal nexus between my not voting and the disastrous consequences of everybody's not voting, that is, since the disastrous consequences will or will not occur whether I vote or not, then it is not immoral of me not to vote, and, if voting is more than slightly troublesome, it might even be irrational of me to vote in an election in which the chance that my voting will have important political consequences is infinitesimal. (11)

How do we apply the generalization argument to the prisoner's dilemma? Here "doing the same thing" could refer either to both prisoners' confessing or to both prisoners' not-confessing, and it is clear that if both were to confess the consequences would be worse than if both were not to confess, for (6,6) is worse than (2,2). The matrix has been simplified by effectively eliminating all options where the prisoners do different things; and so we no longer have the Prisoner's Dilemma. An adherent of the generalization argument must on moral grounds choose the course of action which, if chosen by everybody, would have the best consequences: here the choice that would have the best consequences is the choice not to confess.

Since the generalization argument is far from being universally accepted as true or sound, and since someone, e.g., an egoist,

might surely object to characterizing the choice not to confess as the moral choice, Hopkins attempts to support his position by illustrating the "apparent conflict" between prudence and morality by another example.

"In the situation of an open market with many small producers whose productive capacity exceeds demand, wheat farmers for instance, it is in the interests of all the producers to limit production. Nevertheless, the actions of any one wheat farmer cannot affect the price, so no matter what the other farmers decide it is to the advantage of each individual farmer to raise as much wheat as he can .... Hence, each farmer, seeking to maximize his personal interests, ensures the general ruin of wheat farmers. Of course, this strategy, which a game theoretical simulation would prescribe for the farmer, is not in his real interests." (p. 495-6)

(It is not precisely true that "each farmer ... ensures the general ruin of wheat farmers" -- this is not in any one farmer's power -- it is rather the actions of all, or most, of the farmers that "ensures the general ruin". Further, the claim that "this strategy ... is not in his real interests" is wrong: in the circumstances described there is no better "strategy" available, given the costs of colluding. (12) )

"Were the farmer, on the other hand, prone to reason ethically, such steps [actions of the federal government with respect to price supports and acreage limitations] might not be necessary. Using the generalization argument, for instance, each farmer could see that bad consequences [for whom?] would result if all raised as much wheat as they could, and hence, would conclude that he ought to follow self-imposed limitations." (p. 496)

Following self-imposed limitations is the moral thing to do. But, unless all or most follow such limitations, any farmer who did "the moral thing" would be a fool. Hopkins sees this, and backs off from saying that the man who acts rationally or prudently and does not follow self-imposed limitations is acting immorally. For, according to Hopkins, we are really in a "state of nature" situation (an implicit reference to Hobbes' use of that term when there exists no civil society and so no morality). If the farmers follow no limitations then the market will collapse and the government will enter the game to impose acreage limitations and offer price-supports.

So the moral thing for each farmer to do would be to apply the generalization argument, but if most do not, then the next-best thing

to do is to act prudently, to count the situation as a Hobbesian "state of nature" situation and to grow all the wheat he can. Then government will change the nature of the game by its coercive acreage limitations and price-supports.

There's something wrong here.

Is it not quite odd that we usually find fault with an industry dominated by price-searchers (monopolists, oligopolists, etc.) and are ready (in such a context) to write paeans of praise for the purely competitive market, where each seller is a price-taker -- that is, sells too small a share of the total product to affect its price significantly -- pointing out how the consumer is thus benefitted (for competitive equilibrium is Pareto optimal for the inclusive group of both producers and consumers); and yet, when we look at things from the point of view of the individual seller in a "perfectly competitive market", find our hearts going out to him in sympathy, even to the extent of sometimes being willing to guarantee that the market will not be competitive (to the disadvantage of the consumer, of course). On the one hand we act, by anti-trust laws, etc. to ensure that individual sellers will not be in a position to affect the price significantly and so to exploit others for in general, market organization works efficiently only to the extent that the Prisoner's Dilemma applies to each producer sub-group; on the other, we act to protect sellers from the consequences of "perfect competition", modifying the rules so that exploitation is possible.

Let us ask two questions: would the bulk of wheat farmers ever generally do the "moral thing" -- voluntarily impose limitations on themselves? The answer, given the impossibly high costs of organizing and maintaining so large a "ring" of colluders, is: No. No farmer acting independently will have any incentive to modify his own behavior either in the short or long-run despite his recognition that joint action in restricting supply would increase total profits. The second question is this: who would be benefitted and who hurt by such a "moral" collusion? It is clear that collusion would benefit those farmers who would benefit from a stable market (but hurt those farmers who would have gained a larger share of the market once the less efficient farmers were driven out of the market) and would hurt the consumers -- giving them wheat at higher prices than otherwise. And if it is reasonable for farmers to collude -- in the name of morality! -- then it would be reasonable for all other producers to collude: butchers, bakers, candle-stick makers, doctors, lawyers, and merchant chiefs. In short, every group which could be hurt by competition among themselves is implicitly encouraged by Hopkins to collude -- on moral grounds.

Hopkins appears to believe that the farmers' dilemma is really analogous to the prisoners' dilemma, which would mean that maximizing the production of wheat always strictly dominates producing the Pareto optimal quantity; and he then goes on to make policy recommendations based on this assumption. He appears not only to fail to see the relevance of the fact that many Prisoner's Dilemma games are being played simultaneously, but also to have failed to take sufficiently into account important characteristics of commodity production. He appears to forget that the game of wheat farming is an iterated game, with all the consequences this entails; that the risks involved in farming can be reallocated or "laid off" on others willing to take or share these risks through selling short, "hedging", using futures markets and all the other institutions of a mature capitalist economy which facilitate reallocating risk; that wheat farmers are not normally limited to producing nothing but wheat; that even in price-takers' markets (or pure competition), there are variations in the speed with which individuals make adjustments, and that in such markets there would tend to be a convergence towards a solution which would maximize the utility of various factors of production.

That Hopkins has failed to see the bad consequences of government restrictive action is clear. Consider the paragraph with which he ends his essay.

Finally, it may be suggested that game theory may be thoroughly analogous, in an ideal manner, to the generalization principle in ethics. For in a perfect or ideal society, game matrices, as a tool for calculating strategy, would reflect situations in which it would never be prudent to act immorally. Just as in our example of the wheat farmer in which government action can alter each individual's game matrix so that avoiding bad consequences for all is in the interest of each, in the ideal society all situations would be structured in this manner. (p. 500; my italics)

This is a glorious example of myopic social policy but one nicely consistent with a vision of a Platonic "closed society." The long-run consequences for the farmers and for society are ignored -- nothing is said about the bad consequences of attenuating private property rights or about the function of the open market in allocating inefficient farmers to jobs where they are more productive and so worth more. Nothing is said about the consequences for consumers, who must not only pay higher prices for wheat but also pay taxes to keep the market up (for the farmer has proved pretty skillful in evading government regulations). We have done in the United States precisely what Hopkins suggests is the "ideal" thing to do, and yet it is clear that we have dismally failed to do the job of protecting

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the farmer (who is counted as a special case because his job entails playing a cooperative game with a sometimes uncooperative nature -- at least this is the only conceivable justification for protecting farmers more than for protecting hula-hoop manufacturers).

Note that if the government is to control production it must control the producers and limit their freedom. Would, for example, a man who wanted to become a wheat farmer be able to get a wheat allotment? Hopkins' ideal society would be one in which one person would have a wheat allotment, another an allotment to dig so many tons of coal, another an allotment to cut so many heads of hair, another an allotment to teach logic to so many college students, etc. If one were to wonder how different such an "ideal" society is from our present one in which there are already effective cartels of physicians, of hairdressers, of street-car conductors, etc., the answer is that the principles we now see exemplified would be extended (on moral grounds!) over the whole range of production instead of only over part, as at present.

It is a mistake to assume that there is always (at least) one good solution to a problem. The farmer's dilemma has no easy solution. Nor would an easy solution -- indeed any solution -- be in the general interest. Fortunately our basic social and economic institutions are such that a man has a choice between entering a relatively risky occupation like farming or hula-hoop manufacturing, and a relatively secure occupation like teaching. A wheat farmer who cannot derive satisfactory income, monetary and psychic, in the relatively risky game of farming is free to leave the farm for another occupation, one that promises more security. There is no reason to seek to eliminate the risk attached to certain occupations, given the cost to others of doing so, and certainly no moral reason -- though of course most people seem to expect other people to bear part of the cost when things go sour. If a man were bound by law to be a wheat farmer, if he were in effect a serf, if he had no choice in adjusting his taste for risk to an occupation which satisfied that taste, then he might well deserve money from other people's pockets when things go bad; but not otherwise.

### III

Another author, Anatol Rapoport, offers a somewhat (but only somewhat) different solution to the Prisoner's Dilemma. (13) He suggests that underlying assumptions be chosen arbitrarily. Instead of using as a basis of calculation "Where am I better off?", each Prisoner might well start with "My partner [!] is like me and so is likely to

act like me. If I conclude that I should confess, he will probably also conclude the same; and if I conclude that I should not confess, he will probably conclude the same. But in the first case we would both lose 2 years; in the second case we would both lose 6 years. This indicates that I personally benefit by not confessing."

Now when Rapoport says that we choose our underlying assumptions arbitrarily, supporting this by the assertion that many such assumptions, though seemingly absurd, are useful in science, and that what counts is not the absurdity of the assumption but the consequences of making it, he moves into an area in which we cannot follow him. It's true that to the extent I know another person is like me, I can predict his choices by asking what I should do in similar circumstances. If I know, for example, that a friend has musical tastes similar to my own, I can predict which phonograph records he will consider buying for himself at the big record sale at the local emporium. But this is the case where there is no conflict of interests; and game-theory deals precisely with methods of analyzing conflict.

Rapoport believes, in effect, that he has found a way of virtually eliminating from consideration the lower-left and upper-right boxes. These give results of choices in which the prisoners do different things. But the fact of the matter is that it is better for each individual to confess no matter what the other does -- if that individual is not at all interested in what happens to the other and if a choice made by one has no causal influence on the choice made by the other. One cannot really move from egoism to utilitarianism quite so easily as Rapoport implies. Of course if I can count on the other's good will or concern for "social values" and I know that he can count on mine, I will choose not to confess. If the two prisoners are brothers, or father and son, or, to use Rapoport's term "partners", they will choose a jointly maximizing strategy. The assumption I should make about the other's strategy, and he about mine, is not arbitrary: it depends on who we are. (14)

Rapoport has in effect changed the game from that of the Prisoner's Dilemma to a game in which the choosers are friends (remember Aristotle's definition of 'friend': another self) or partners, to a game played cooperatively -- and a different set of standards of course applies. There's no contradiction in saying that it is rational to confess in one game and rational not to confess in another. In sum, unless I am interested in the welfare of the other, I shall make an assumption in a Prisoner's Dilemma game that what I do the other will do only if making that assumption is in my interest.

Rapoport goes on to defend the prisoners' "assumption of similarity"

by considering an analogous assumption:

"The assumption of similarity is indeed the rationale which induces the individual citizen to vote. The argument that a single vote 'makes no appreciable difference' is countered with 'Yes, but if everyone thought so, the will of the collective would find no expression'. This is the rationale behind cooperative effort."

But, as was said above, what is important is not that a given individual vote; what is important is that not everyone (or nearly everyone) avoids voting. In an election in which my single vote makes, it is virtually certain, no political difference, I have no obligation to vote, for I shall at the same time be virtually certain enough others will vote to make the institution "work".

Rapoport gives another example:

"It is conceivable that the (minimal) danger inherent in submitting to vaccination actually exceeds the (still more minimal) danger of remaining unvaccinated. But if everyone minimized the danger to himself alone, everyone would be subjected to the much greater danger of a smallpox epidemic."

It is clear that generally when a person is inoculated against a communicable disease, he protects not only himself, but by reducing the potential agents of contagion, he also benefits others. On the other hand, immunization uses up resources (and may be unpleasant or even slightly dangerous) and so the optimal proportion of the population immunized will not normally be 100%. To illustrate: suppose all but one person were inoculated; then to inoculate that last person would not benefit others who, themselves being inoculated, could not catch the disease. So here again, although one could say to the last uninoculated person: "But suppose everyone did the same!", he could reasonably answer, "But everyone didn't, and since there is no danger that anyone else will be harmed, I'll not be inoculated." (15)

#### IV

According to Runciman and Sen, in a recent article in Mind (16), the conflict between what seems individually better (confess) and what produces the best over-all result (not confess) contains

"the essence of Rousseau's distinction between the 'will of all' and the 'general will'. The 'general will' of the prisoners, we

can say, is to avoid confession, but each person's 'particular will' is to confess. Since in the absence of enforced collusion their self-seeking will take them to a situation worse for both, what is needed is an enforceable contract between them. They would both be ready to appoint an agent who would see to it that neither of them confessed. In the absence of sanction (or, we might even say, of a Sovereign), each prisoner may be driven by rational self-seeking to break the contract which is to the common advantage of both. This gives an immediate and plausible sense to Rousseau's notion of the members of a society being 'forced to be free' ...."

Runciman and Sen have offered us a model which comes perhaps as close as any model can to "voluntary coercion". If each prisoner sees that his only real alternative to 2 years in prison is one which he values as worse than two years -- he will of course choose the lesser penalty. Our new matrix is this:

	2	2+
2	10	
10	6	
2+	6	

Figure II  
Rousseau game

Now we have a game in which each Prisoner will make a "rational" choice which is also better for both jointly. Both would, presumably, prefer to play a Rousseau-game, to choose when the matrix was coercive; but of course one could no longer say that the Prisoner's Dilemma game was being played. And if a man were a wheat farmer, he would probably prefer a Rousseaugame if his allotment were high enough, if he was content with a stable market, and if only wheat farmers were playing this game. But if all Prisoner's Dilemma games were changed into Rousseau games (by the addition of coercion), the players in any one game would be colluding against all other players playing similar collusive games; and rationality would not lead a person to a choice of a Rousseau-game if a necessary concomitant of his choice was all others' choice of Rousseau games -- he would prefer that he and everyone else play Prisoner's Dilemma games. Barbers, to avoid price-cutting and market competition collude against all who would like the price of a haircut to be no higher than the competitive rate -- and against all those who would like to be barbers,

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those whose training and talent would fit them to be most productive as barbers but to whom the market is closed by a guild; but of course barbers do not like the fact that other guilds force them to pay higher prices for goods produced by members of these other guilds. As a producer of  $\underline{x}$ , I want to play a collusive game with my fellow-producers of  $\underline{x}$ ; but as a consumer I don't want other producers, producers of non- $\underline{x}$ , to play such games. (In the original Prisoner's Dilemma, the public is presumably interested in seeing to it that the prisoners are punished, and if the penalties assigned in the original matrix (Figure 1) are "fair", the public would be glad if both get 6 years, assuming both are guilty. If an enforceable contract were possible, as it sometimes is in practice, when the squealer who gets to prison is treated harshly by those who don't like squealers, then "the public" would lose.)

In sum, Runciman and Sen have offered no "solution" to the Prisoner's Dilemma though they have clearly shown why the prisoners would prefer to play a similar game to which the element of coercion to enforce contracts was added. With respect to their suggestion that the "general will", when coercively enforced, fulfills the conditions of Pareto optimality, it appears clear that this is true only of the subgroup of prisoners and not of the inclusive group of the general public, of the subgroup of wheat farmers but not of the inclusive group of consumers-producers.

One further point relevant to the extent of realistic Rousseau game analogues. Runciman and Sen write:

The general will, though remaining unalterable, becomes subordinated to the encroachment of individual wills when "each, separating his interest from the interest of all, sees that such separation cannot be complete, yet the part he plays in the general damage seems to him as nothing compared with the exclusive good which he seeks to appropriate" -- an account which fits exactly the case of the prisoner who seeks to gain an advantage by breaking the contract. (p. 556)

I am inclined to believe that neither the Prisoner's Dilemma nor the Rousseau game best analyzes the rational choice of an individual when the goods to be chosen are various quantities of private and public (or "common") goods. A more satisfactory analysis, would, I have been persuaded (by James Buchanan in a recent article) (17), lead to the conclusion that an expanded 3-by-3 choice matrix would better illustrate the opposing pressures on the individual, some of which lead to cooperation and others of which lead to conflict. Though I am not sure, it might even be possibly better to illustrate the

farmer's dilemma with an appropriately expanded game matrix, one in which the dominance features are removed.

In conclusion, I should like to suggest that the fairly extensive technical literature dealing with the Prisoner's Dilemma and related games might well be found worth studying by one who attempts to deal with some central issues in social philosophy, issues, for example, such as the desirable range and allocation of "public goods" (together with the related "free rider" problem); the nature of, and incentives to, "social" and "anti-social" behavior in large-number and small-number groups; the desirable range of institutions which foster competition and/or cooperation, together with related problems concerning inter-firm organization (duopoly, oligopoly, etc.), problems concerning federalism and its alternatives, and the like.

## NOTES

1. The theory of games, R. B. Braithwaite tells us ("The Theory of Games and Its Relevance to Philosophy", Philosophy in Mid-Century, Firenze: 1958), was developed to provide "exact criteria for a person's deciding how he should choose to act in a situation in which the outcome depends not only upon his own choice of action but also upon the choices of action of a number of other people. Such situations arise whenever people with different interests can only further their individual interests by acting in common, and lie at the root of economics and of the other social sciences." (p. 148)

If one takes 'rational decision' to mean a decision which maximizes expected utility (a decision which yields the more preferred outcome, a decision in which an individual chooses "more" rather than "less") then clearly one decision can be "more rational" than another if the individual is better informed as to the range of alternatives open to him, if the results of alternative choices of action are more fully known and predictable, and if separate decisions are consistent with one another. There is evidence that game theory can help an individual in making rational decisions, can help us, in Seriven's words, in "deciding how most efficiently to do what we want to do." (Ethics, Vol. 68, Oct. '57, p. 62)

2. "Moralists and Gamesmen", Philosophy, January 1959, p. 11. C.f. "Games and Aims", Aurel Kolnai, Proceedings of the Aristotelian Society 1966, esp. pp. 120-124.

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3. Note that the numbers in Figure I are somewhat arbitrary; any numbers will do but only so long as the following relationships prevail: where R stands for the Reward for cooperating (e.g., 2 years), S for the Sucker's payoff (e.g., 10 years), T for the Temptation to get a "free ride", (e.g., 1 year), and P for Punishment (e.g., 6 years), then  $S < P < R < T$  (e.g.,  $10 < 6 < 2 < 1$ ) and  $2R > S + T$  (e.g.,  $4 > 10 + 1$ ).
4. Cf. the general discussion of the issue in R. D. Luce and H. Raiffa, Games and Decision (New York: 1957); and the experiments of Rapoport and Chammah, Prisoner's Dilemma (Ann Arbor: 1965), which indicate that the proportion of cooperative responses reaches approximately 70% after repeated plays (Ch. 5).
5. University of Michigan Press (Ann Arbor: 1965).
6. The Century Dictionary (1914) illustrates:  
A strong dilemma in a desperate case!  
To act with infamy, or quit the place. (Swift)
7. If the matrix were slightly changed by substituting (5,5) in the lower right-side box for (6,6), the problem for the utilitarian would be complicated by the need to estimate probabilities, etc.
8. "Once the limits of 2-person zero-sum games are transcended, game theory, while remaining a powerful tool for analyzing the logical structure of conflicts of interest, loses its prescriptive power. In this realm, strategically rationalizable courses of action are frequently intuitively unacceptable and vice versa," Rapoport and Chammah, op. cit., p. 23.
9. "Reflections on Game Theory and the Nature of Value," R.P. Wolff, Ethics, April 1962, p. 171; "Game Theory and 'Social Value' States," G. Thompson, Ethics, October 1964, p. 36; and "Rationality and Social Value in Game Theoretical Analysis," V. Held, Ethics, April 1966, p. 215.
10. "Game Theory and Generalization in Ethics", October 1965.
11. Cf. my "Why Care What Would Happen if Everybody Acted Like Me?", Memorias del XIII Congreso Internacional de Filosofia, Vol. 7, 1964, and "Is It Necessary or Useful to Randomize?", Analysis, January, 1966.
12. 'Strategic behavior' usually refers to an action expected to exert

some influence on the behavior of others, e.g., in an iterated Prisoner's Dilemma game, one might adopt a tit-for-tat strategy, playing whatever the other played last time. On this use of 'strategic behavior', no strategic behavior is available to the farmers. Strategic behavior is unavailable to members of a group whose size is critically large; c.f. J. M. Buchanan, "Ethical Rules, Expected Values, and Large Numbers", Ethics, Vol. 76, No. 1, October, 1965.

13. Fights, Games, and Debates (Ann Arbor: 1961), pp. 175 ff. Other interpretations of the Prisoner's Dilemma matrix have been suggested by Rapoport and Chammah: "... the two players can be asked to imagine that they are two firms in competition. Each has a choice of selling its product at one of two price levels. If one firm sells at a high level while the other sells at a low level, the second firm reaps the profit (by winning the market). If both sell at a high level, both profit (though not as much as when competition is eliminated). If both sell at a low level, both lose money. Clearly this situation is isomorphic to the Prisoner's Dilemma. Or, the players can imagine that they are rival power blocs who have made a disarmament agreement. The cooperative choice now means keeping the agreement; the defecting choice, breaking it. There is supposedly an advantage accruing to the bloc which breaks the agreement unilaterally, etc." Prisoner's Dilemma, p. 222.
14. Who we are depends very often, as James Buchanan has pointed out (Ethical Rules, Expected Values, and Large Numbers", Ethics, October 1965), on the size of the population dealt with. The general rule of prediction: the larger the population the less likely they will act like friends (or apply the generalization argument). If we're interacting with just a few people whose interests are visibly affected by actions of ours, we act one way; if we're interacting with a great many people who are not visibly affected by what we do, we act another way.
15. C.f. "Economic Analogues to the Generalization Argument", J. M. Buchanan and G. Tullock, Ethics, July 1964.
16. "Games, Justice, and the General Will", October 1965.
17. "Cooperation and Conflict in Public-Goods Interaction" (mimeographed, 10/28/66).

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## CONSTITUTIONAL ASYMMETRY (1)

By

David Tuerck

The theory of public finance consists in part of certain widely-accepted "principles of taxation." Though seldom realized in practice, these "principles" are usually regarded as axiomatic to any notion of a good fiscal policy. Thus, we usually accept without question the proposition that there should be equal or uniform treatment of equals, reasonably classified. While the exact meaning of this "equity principle" depends on what we consider a "reasonable" classification of equals (and economists have argued whether the classification should be made according to income, wealth, property, or some other such index), there is no doubt about its fundamental rightness. Its source

is the principle of the equality of individuals before the law. . . . Arbitrary and capricious treatment of individuals by legal institutions is prevented by constitutional law, and this constitutional protection against arbitrary or discriminatory treatment by government has been extended to apply to the distribution of taxes. (2)

If the equity principle applies to the distribution of taxes, though, shouldn't it apply also to the distribution of benefits or to that of public expenditures? Isn't it just as important to avoid "arbitrary and capricious treatment" of equals on one side of the fiscal account as it is on the other? To judge from the writings of many economists (some of whom are mentioned at the end of this essay), the answer is no. Historically, students of public finance have tended to treat fiscal equity solely as a question of ability to pay, disregarding for the most part questions of individual benefits. While it requires uniformity in taxation, therefore, the equity principle may be said to permit discrimination in benefits, a condition described by Professor James Buchanan as the "fundamental fiscal asymmetry." (3)

The objection to this fiscal asymmetry is plain. Suppose that there is uniformity of some kind in taxation. Tax burdens are

distributed in some ideal fashion among the general public. Does it follow that the overall fiscal structure is ideal? Obviously not, since the ultimate measure of any one person's fiscal position is the net benefits (or burdens) that he receives (or bears). The distribution of net benefits depends as much upon the distribution of total (i.e., infra-marginal) benefits as it does upon that of taxes. Hence, the need exists for some kind of uniformity in both taxation and benefits or for what we may call "fiscal symmetry." Ideally, the equity principle should apply to both sides of the fiscal account in order to promote the best possible distribution of net benefits.

Failure to appreciate the logic of this argument may lead to distortions in actual fiscal policy. Constitutional law supposedly places sensible limitations on the decision process in which such policy is made. Yet, it may not do so if the limitations it imposes have been framed without any regard to benefits. Consider a community whose members vote directly from time to time on various expenditure proposals. Majorities cannot use the taxing power to exploit minorities, since tax legislation must apply uniformly to all members of the community. But, without a similar restraint on the spending side, majorities can exploit minorities, anyway, merely by approving expenditures that are of special interest to themselves. "Inequities" may therefore emerge despite the constitutional limitation on the taxing power.

Inefficiencies, too, are possible. Let us say that fiscal choice is "inefficient" if the community accepts a proposed expenditure whose total cost exceeds its total benefits or if the community rejects a proposed expenditure whose total benefits would exceed its total cost. "Inefficiencies" of the first kind are possible, since the majority will approve any expenditure from which it derives net benefits, even if it thereby imposes a net burden on the community as a whole. The uniformity requirement permits it to spread the total tax burden over the community while keeping almost all benefits for itself. As for "inefficiencies" of the second kind, they, too, are possible, since the majority will reject any expenditure from which it could not derive net benefits, even though net benefits to the community would be positive. In this case, the uniformity requirement prevents it from shifting taxes toward persons who would benefit more from their expenditure.

These conclusions follow, of course, from a highly simplified model of the real world. Actual fiscal choice is more likely to serve the "public interest" than it suggests. For one thing, the executive branch of government is at least as important as the legislative in framing fiscal policy. For another, legislators do not (and should not)

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vote merely to serve their own or their constituents' self-interest. Instead, they take at least some interest in the effects that any proposed expenditure would have on the community as a whole.

This argument does not prove that distortions will be completely absent from fiscal policy, however. In the first place, individual notions of the "public interest" vary greatly, so that it is still necessary to limit the spending power. As we shall see, the "public interest" is often invoked against, not in favor of, limiting that power. In the second place, there is a tendency for the public-interest approach to break down, anyway, because of vote-trading or "log-rolling." Legislators, no matter how selfless, are motivated to win any expenditure that would be especially beneficial to their constituents. However, since any such expenditure is unlikely to benefit a majority of the community (especially if it is of the "porkbarrel" variety) its sponsors are forced to "buy" the support of other legislators by agreeing to support expenditures of special interest to their constituents. Eventually, therefore, an expenditure "package" will be approved that does confer net benefits upon a majority of the community.

How does this logrolling process cause distortions like those just examined? Well, here again there is at least a temporary "exploitation" of the minority by the majority. The expenditure "package" may confer net benefits upon only a subset of the community and still win approval. Of course, logrolling is a game that anyone can play, so that members of a losing minority may eventually find themselves part of a winning majority. But logrolling may still operate to the disadvantage of persons whose representatives lack either the skill or motivation to play the game successfully.

What inefficiencies will logrolling produce? Once more we can expect expenditures to be approved that impose net burdens upon the community as a whole. Since the majority shares the cost of any expenditure with the minority, its representatives will not take this cost fully into account. Hence, they will approve an expenditure "package," even though its total cost exceeds benefits and even though it is therefore "inefficient." Since expenditures of special interest to minorities tend to get approved, the second "inefficiency" described above seems less likely. Yet, we might still expect certain expenditures conferring net benefits on the community as a whole to fail because the majority cannot shift part of their costs. As we observe below, this is exactly what may be preventing federal participation in interstate compacts.

Whether or not we admit "public-interest" or other considerations

into the model, therefore, the fiscal asymmetry gives rise to certain distortions. How, then, could we approach a more satisfactory definition of fiscal equity? At least two answers are possible: We could say, on the one hand, that there should be equal treatment in both taxation and benefits. Persons paying equal taxes should also receive equal benefits. While a norm of this kind may have a certain appeal, however, it would not be likely to command widespread support. Though we might agree that residents of West Virginia and Illinois should somehow be equal in taxation, we might not agree that they should also be equal in either total or net benefits. Perhaps residents of the one state deserve a greater share of benefits than do those of the other.

An alternative norm, on the other hand, seems wholly acceptable. This norm says only that there should be some equality or uniformity in benefits, whether or not equals are classified in the same manner in both taxation and benefits. Thus, we might say that, for certain expenditures, there should be equal treatment of all residents of either West Virginia or Illinois but unequal treatment of the two states considered as separate groups. Residents of the one state could therefore receive a greater share of benefits. This second, more general, version of the symmetry norm seems compatible with almost any distributive goal.

Now merely applying the equity principle to benefits would not eliminate altogether the distortions discussed above. Yet, either of the two norms just suggested would at least reduce each distortion. Majorities would tend less to "exploit" minorities and to disregard the effects of their actions upon the community as a whole. Why, then, has the symmetry norm received so little attention? One reason already given is the tendency of economists to ignore the spending side. But there may be another, quite different, reason that economists don't ordinarily consider, since it has to do with the law rather than economics proper. If the equity principle has its source in constitutional guarantees that apply to the distribution of taxes, it is apparent that similar guarantees have not been extended to apply to the distribution of expenditures. "The equity principle has never been applied to the distribution of public expenditures, although the reason for such application would seem equally valid." (4) My purpose here is to show that this second explanation is essentially correct. There has been a neglect of the benefit side in the law as well as in economics, and this neglect has given rise to an asymmetry which the economist himself may examine critically.

The legal requirement of equality or uniformity in federal taxation has its source in at least three provisions of the Constitution:

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(i) the first clause of article I, section 8, which provides that "all duties, imposts and excises shall be uniform throughout the United States," (ii) the fourth clause of article I, section 9, which provides for the apportionment of "capitation or other direct taxes," and (iii) the fifth amendment, which provides that "no person shall . . . be deprived of life, liberty or property, without due process of law." The requirement, as it applies to state taxation, derives in part from the fourteenth amendment, which provides that "no State shall . . . deny to any person within its jurisdiction the equal protection of the laws." Let us examine briefly the judicial interpretation of these provisions that has evolved.

One of the first issues to concern the Supreme Court arose out of controversy over the jurisdiction of the "uniformity clause" of article I. After Congress had levied several "excises" at uniform rates throughout the United States, taxpayers claimed that these levies were not excises at all but direct taxes which had not been apportioned and which were therefore unconstitutional. In an early decision (5), however, the Court ruled that one of these levies was indeed an excise (an "indirect" tax) and that it therefore fell within the jurisdiction of the uniformity clause. Only capitation taxes and taxes on "land," it said, may be regarded as "direct" in the sense intended by the Founding Fathers.

Because the Court has, in almost every instance, upheld the validity of uniform but unapportioned federal taxes and because Congress has intentionally levied only a few direct taxes (these in its early history), federal tax legislation has generally fallen within the jurisdiction of the uniformity clause. According to the Court, the limitation thus imposed is one of "geographical uniformity." "The tax is uniform when it operates with the same force and effect in every place where the subject of it is found." (5) This doctrine has been reaffirmed time and again in cases involving a wide range of taxes, including the income tax. (7)

While the uniformity clause imposes one limitation on the power to tax, it does not forbid discriminations based on criteria other than geography. Strictly speaking, it would permit a differential tax on Republicans provided the latter were taxed everywhere the same. Thus, it is not surprising that the Court has developed another, more general, doctrine that it can apply to such discriminations should they arise. A hint of this doctrine appeared in the 1900 case of Knowlton v. Moore (8), in which the Court upheld a progressive succession tax but conceded implicitly that progressive taxation as such could discriminate unfairly. The same doctrine was given more concrete form a few years later in the case of Brushaber v. Union Pacific R. R. Co. (9).

A graduated rate provision of the income tax, the Court said, did not violate the due process clause of the fifth amendment as had been alleged. But, it added, the argument that discriminatory taxation cannot deny due process

would have no application in a case where . . . the act complained of was so arbitrary as to constrain to the conclusion that it was not the exertion of taxation but a confiscation of property, that is, a taking of the same in violation of the Fifth Amendment, or, what is equivalent thereto, was so wanting in basis for classification as to . . . inevitably lead to the same conclusion. (10)

Thus, the fifth amendment came to impose an additional limitation on the federal power to tax.

"Substantive" due process is a comparatively recent product of judicial review, the original interpretation having been merely "procedural." In the course of time, however, the courts have found it desirable to broaden the meaning of the fifth amendment so that it implies an "equal protection" limitation similar to the one expressed in the fourteenth. As the Supreme Court said in one of the segregation cases, it is true that

the Fifth Amendment . . . does not contain an equal protection clause as does the Fourteenth Amendment . . . But the concepts of equal protection and due process, both stemming from our American ideal of fairness, are not mutually exclusive. The "equal protection of the laws" is a more explicit safeguard of prohibited unfairness than "due process of law" . . . But, as this Court has recognized, discrimination may be so unjustifiable as to be violative of due process. (11)

Geographical uniformity is therefore a necessary but not a sufficient condition for constitutionality in tax legislation. Any attempt to legislate an "unjustifiable" discrimination would surely fail, even if the tax operated "with the same force and effect throughout the United States." While it has had to pass on the constitutionality of few, if any, such attempts, the Court might well be expected to overturn a federal tax discriminating among individuals, say, on the basis of their past or present memberships in Communist organizations or on the basis of their feelings toward other races and nationalities. According to the doctrine of geographical uniformity, of course, it would overturn any federal tax discriminating against a person solely on the basis of his place of residence in the United States.

The due process clause and the uniformity clause each provide

a safeguard against discriminatory federal taxation, therefore. (We may dismiss the direct tax clause as a dead letter.) Do similar safeguards exist at the state level? The answer may be found in both state and federal constitutions. Despite a tendency to interpret them more and more loosely, most state constitutions still have clauses requiring some kind of uniformity in taxation. As for the federal constitution, the equal protection clause of the fourteenth amendment has already been mentioned. According to an 1890 decision (12) of the Supreme Court, that clause "was not intended to prevent a State from adjusting its system of taxation in all proper and reasonable ways." But "clear and hostile discriminations against particular persons and classes, especially such as are of an unusual character, unknown to the practice of our governments, might be obnoxious to the constitutional prohibition." (13)

Since the Court regards equal protection as "a more explicit safeguard of prohibited unfairness" than due process, it is not surprising to find that the equity principle applies even more explicitly to state than to federal taxation. That it does so is shown clearly by the following passage from a decision in which the Court overturned a state law requiring railroads exclusively to pay certain attorneys' fees:

The State may not say that all white men shall be subjected to the payment of the . . . fees . . . and all black men not. It may not say that all men beyond a certain age shall be alone thus subjected, or all men possessed of a certain wealth. These are distinctions which do not furnish any proper basis for the attempted classification. That must always rest upon some difference which bears a reasonable and just relation to the act in respect to which the classification is proposed, and can never be made arbitrarily and without any such basis. (14)

Though it has done so sparingly, the Court has invoked equal protection against a number of other state taxes, including certain sales and income taxes. Clearly, then, the constitutional limitation on the power to tax is even stronger at the state level than it is at the federal.

Now the next question is whether the law imposes limitations on benefits at either level of government comparable to those it imposes on taxation. To begin at the federal level, there seem to be several reasons why it does not, the first and perhaps most important of these being that neither individual taxpayers or states ordinarily have standing to challenge the legality of federal appropriations.

Though taxpayers have ordinarily had standing to challenge the legality of nonfederal appropriations, the Supreme Court refused in the famous case of Massachusetts v. Mellon (15) to consider on its merits a suit challenging a federal grant-in-aid called the Maternity Act. In order to create a true controversy, it reasoned, a taxpayer must have a personal interest in his suit. But, it said,

His interest in the moneys of the Treasury -- partly realized from taxation and partly from other sources -- is shared with millions of others; is comparatively minute and indeterminable; and the effects upon future taxation, of any payment out of the funds, so remote, fluctuating and uncertain, that no basis is afforded for an appeal to the preventive powers of a court of equity. (16)

Similarly, the state in this case was said to present no "justiciable controversy either in its own behalf or as the representative of its citizens" merely because it considered the Act unconstitutional. "What burden," asked the Court,

is imposed upon the States, unequally or otherwise? Certainly there is none. . . . Nor does the statute require the States to do or yield anything. If Congress enacted it with the ulterior purpose of tempting them to yield, that purpose may be effectively frustrated by the simple expedient of not yielding. (17)

The significance of Massachusetts v. Mellon is apparent. Even though taxpayers qua taxpayers can challenge tax legislation on the ground that it discriminates unreasonably, the same persons (or a state acting in their behalf) cannot challenge appropriation legislation on a similar ground. At least the first version of the symmetry norm is violated, therefore, since the law does not require equal treatment of the same persons (or states) in both taxation and expenditures.

A more difficult question is whether the law fails to require any uniformity in benefits or whether it violates even the second, more general, version of the norm. Evidence that it does may be found in some of the relatively few decisions that contain mention of the spending power. In the 1896 case of United States v. Gettysburgh Electric Ry. Co. (18), for example, the Court recognized Congress's "great power of taxation to be exercised for common defence and general welfare" (19), emphasizing the broad nature of that power. More recently, in the well-known case of United States v. Butler (20), it specifically endorsed the "liberal" or Hamiltonian view that "the power of Congress to authorize expenditure of public money for public purposes is not limited by the direct grants of legislative power found in the Constitution." (21) Taken alone, these passages

suggest that in fact the Constitution does fail to impose a limitation upon federal expenditures and that the symmetry norm is violated, however it may be construed.

Of course, common sense as well as opinion cited above suggest that there must be at least some implied limitation. So a federal district court conceded, anyway, in upholding an appropriation statute. "It not only is no longer an open question that Congress has power to appropriate money to promote the general welfare," said the court, "but the determination of the Congress that the projects are in furtherance of the general welfare is decisive, unless arbitrarily made and clearly wrong." (22) The proviso in italics implies that the law may require some kind of uniformity in benefits, after all. Perhaps individual citizens, acting in a capacity other than that of taxpayers, can challenge federal appropriations and in that way secure relief from unfairly discriminatory treatment. Because of this possibility, our task is complicated. If it exists at all, the asymmetry (in the general sense) must be one of degree. Demonstrating it requires showing that injustices are relatively more likely and relatively more significant on the benefit than on the tax side.

Even if we grant that special circumstances will confer a standing to sue, however, it remains apparent that the law imposes no limitations on federal expenditures comparable to those it imposes on taxation. In short, a person may resist an unfair expenditure provision, but he is less likely to succeed than if he resists an equally unfair tax provision.

Recent articles (23) by Professor Charles A. Reich provide evidence to this effect. Professor Reich has written that federal, state, and local governments are becoming more and more arbitrary in the provision of "largess" or "social-welfare" benefits. Several doctrines account for this arbitrariness, two of which pertain to the fiscal powers. The first of these doctrines he calls the "gratuity principle," whereby certain public expenditures are "gratuities," which government "can withhold, grant, or revoke . . . at its pleasure." The second he derives from the first, calling it the "whole and the parts:" "Since government may completely withhold a benefit it may grant it subject to any terms or conditions whatever. This is essentially an exercise in logic: the whole power must include all of its parts." (24)

These doctrines have their source in a number of Supreme Court decisions. "Pensions, compensation allowances and privileges," according to the Court, "are gratuities. They involve no agreement of parties; and the grant of them creates no vested right. The benefits conferred by gratuities may be redistributed or withdrawn

at any time in the discretion of Congress." (25) Thus, Congress had the power to pass a law suspending social security benefits to aliens who had been deported for their past membership in the Communist party. This is what the Court ruled, anyway, when one Ephram Nestor sued to recover benefits he had lost after passage of the law. Though Nestor had come to the United States in 1913, had belonged to the Communist party only from 1933 to 1939, and had paid social security taxes for some twenty years, he was deported in 1956. Shortly thereafter, his social security payments were suspended.

In the ensuing case of *Flemming v. Nestor* (26), which Reich calls "the most important of all judicial decisions concerning government largess" (27), the Court denied that discriminatory treatment of this kind violated any constitutional limitation on expenditures. In effect, it reasoned that a property right to social security benefits would be impractical. Any such right would impair the ability of these benefits to serve "social" goals.

To engraft upon the Social Security system a concept of "accrued property rights" would deprive it of the flexibility and boldness in adjustment to ever-changing conditions which it demands. . . . It was doubtless out of an awareness of the need for such flexibility that Congress included . . . a clause expressly reserving to it "the right to alter, amend, or repeal any provision of the Act. . . .

We must conclude that a person covered by the Act has not such a right in benefit payments as would every defeasance of "accrued" interests violative of the Due Process Clause of the Fifth Amendment. (28)

The Court admitted that due process could impose a bar in the event of "a patently arbitrary classification, utterly lacking in rational justification." (29) But what constitutes a "patently arbitrary classification" the Court did not say.

The "whole and the parts" doctrine also derives from actual litigation. In upholding conditions imposed by Congress on a federally-subsidized irrigation project, for example, the Court said that "the power . . . to impose reasonable conditions on the use of federal privileges" was "beyond challenge." (30) What constitutes a "reasonable condition"? Again, the Court did not say.

We have already seen that because of *Massachusetts v. Mellon* a state cannot ordinarily question the conditions which Congress attaches to its grants-in-aid. (Since the state is free to accept or

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reject such grants, merely making them available imposes no burden, whatever the conditions imposed.) And, in cases where a state has had standing to sue, the Court has upheld a broad power to condition. Thus, in Oklahoma v. Civil Service Commission (31), the Court did agree to review the state's claim that it had arbitrarily been denied highway funds but then went on to find the claim untrue. Congress had retained the power, said the Court, "to fix the terms upon which its money allotments to states shall be disbursed." (32) Of course, it is only realistic to assume that the law imposes some limitation upon this right: "Congress could not seek an unconstitutional end, such as that of enacting a statute that would require . . . funds be disbursed to 'separate-but-equal' schools." (33) But here we must ask how the law defines the expression "unconstitutional end." The apparent impossibility of answering this and similar questions posed above suggests that constitutional limitations on the federal power to spend are hopelessly vague.

The same conclusion applies equally well to the state power to spend. By the late nineteenth century most states had laid down the rule that state expenditures must serve a public purpose. The state has no right, said the Supreme Court of Pennsylvania, "to raise funds for a mere private purpose. . . . Taxation is a mode of raising revenue for public purposes." (34) The Supreme Court of Maine went so far as to condemn a subsidy to industry as a discrimination in favor of one occupation, manufacturing. "While the State is bound to protect all," said the court,

"it ceases to give that just protection when it affords undue advantages, or gives special and exclusive preferences to particular individuals and particular and special industries at the cost and charge of the rest of the community." (35)

Even the Federal Supreme Court has overturned state legislation authorizing a similar expenditure. (36)

But the trend during this century has been to interpret the public purpose doctrine more and more "liberally" so as to widen greatly the range of permissible expenditures. Thus, in upholding one of the early state unemployment compensation acts, the Supreme Court said:

As with expenditures for the general welfare of the United States, . . . whether the present expenditure serves a public purpose is a practical question addressed to the law-making department, and it would require a plain case of departure from every public purpose which could reasonably be conceived to justify the intervention of a court. (37)

Along with a broad power to make any sort of "reasonable" expenditure, the states seem to enjoy a similar power to attach conditions to their appropriations statutes. Federal and (in general) state constitutions now sanction both powers with the apparent result that many abuses exist in state expenditure policy. (Reich stresses the dwindling rights of welfare recipients.) The equity principle therefore seems poorly defined in its application to expenditures at either level of government.

To show the effect of this condition, let us refer back to Flemming v. Nestor. There, we recall, the Court upheld a provision of the Social Security Act denying old-age benefits to an alien deported because of his past membership in the Communist party. No denial of due process was said to arise from the consequent loss of benefits. But let us suppose that Congress had not deported Nestor or suspended the benefits in question but that, instead, it had imposed an equivalent tax upon him (and upon all other persons similarly situated). Would the Court have upheld the tax? Not according to what we previously observed about the due process limitation as it applies to members of Communist organizations. Even without examining the litigation that has arisen over state and federal treatment of such persons (38), it is not hard to guess that tax legislation of this kind would have failed, though it would have been no different in substance from the provision upheld in Flemming v. Nestor.

The question, then, is why was Nestor not "as equal" to other residents of the United States in expenditures as he most likely was in taxation? Actually, a passage from the majority opinion suggests an answer. "One benefit which may be thought to accrue to the economy from the Social Security system," the Court said

is the increased over-all national purchasing power resulting from taxation of productive elements of the economy to provide payments to persons who would generally spend a comparatively large percentage of their benefit payments. The advantage would be lost as to payments made to one residing abroad." (39)

It seems doubtful, however, whether this supposed advantage of "flexibility" in the Social Security system was sufficiently important to justify the difference in treatment defended here. It seems to rest upon a naive argument for "keeping money at home" that is not so persuasive as to justify any discrimination of doubtful propriety. But if it was not sufficiently important, what was? What principle could have justified this particular discrimination, which, if it had been attempted on the tax side, would in all probability have been invalidated?

Today, it is possible to lose benefits from public expenditures for "offenses" far less serious than actual membership in the Communist party. Mere refusal to disclaim such membership or any other subversive activity has been sufficient to disqualify applicants for federal antipoverty and medicare funds (40) and, in some instances, largess provided by state governments. Would it be legal, under either federal or state constitutions, to impose a differential tax upon anyone refusing to disclaim such activities? If not, why is it legal to impose an equivalent burden upon them in the form of withheld benefits?

The controversial title VI of the 1964 Civil Rights Act gives rise to similar questions about the effect of personal convictions or feelings upon the constitutional right to publically-provided benefits. Under that provision, federal agencies must withhold funds from state or local programs that discriminate "on the ground of race, color, or national origin." Assuming for the moment that a potential beneficiary of any such program sympathizes with its discriminatory features, is it legal to discriminate against him in federal expenditures? Would it be legal to impose a discriminatory tax upon him on the ground of his feelings toward other races or nationalities, provided that these feelings could be known? Again, our previous discussion of due process suggests that the answer is no. Or let us drop the assumption of personal sympathy with racial or similar kinds of discrimination. Is it legal to deny benefits to a person merely because he happens to reside in a city or state that engages in such discrimination? Would it be legal to allow him his benefit but to impose a tax upon him of the same amount? To answer yes would be to condone a form of discrimination that the uniformity clause of the Constitution forbids.

Now we do not have to argue that there is no conceivable justification for legislation of the kind we have been discussing. Nor does it matter here whether there is. The point remains that constitutional law provides no clear rule that permits us to distinguish those expenditures which do create reasonable classifications from those which do not. As we have conceded all along, there is no presumption that the law must define equals as the same persons in both taxation and expenditures. But, when certain persons are treated as equals in either taxation or expenditures, it would seem only logical to treat them as equals in both, unless some acceptable reason exists for not doing so.

To return to an early example, it seems entirely proper, under the Constitution, for Congress to provide "aid to Appalachia" that naturally benefits residents of West Virginia more than residents of

Illinois. The simple fact that the former are, in general, less prosperous than the latter is an acceptable reason for the difference in treatment. This establishes a classification that "bears a reasonable and just relation to the act in respect to which [it] is proposed." Though residents of the two states are tax equals in the sense of the uniformity clause, therefore, they need not receive equal benefits from antipoverty legislation. It is far more questionable, on the other hand, whether it would be proper to depart from geographical uniformity in benefits merely if some West Virginians lived in districts that practiced racial discrimination. Unless some particular basis existed for this departure, the law would be inconsistent (or, we might say, asymmetric) in allowing it. If the purpose is to discourage racial discrimination, then Congress should prohibit such discrimination outright rather than attack it indirectly through the fiscal process.

Now examples of benefits withheld due to Communist activities, racial prejudices, or mere place of residence are relatively easy to find. And all show how a minority can be "exploited" by the majority, which is to say that the fiscal process can operate "inequitably." Showing how this same process can also operate "inefficiently" is a far more difficult task, however. Federal and state legislatures do seem to approve expenditures whose total costs exceed benefits, but actually proving that fiscal choice is "inefficient" in this sense is impossible without measurement. Furthermore, the courts do not review legislative "packages" that consist of several statutes enacted, perhaps, over a long period of time. Actual reform of the law, therefore, must be directed toward its "inequities." Other distortions must be corrected from within the legislative process itself.

At least one exception to this conclusion must be noted, however. As we know, article I of the Constitution requires geographical uniformity in federal taxation. Persons equally situated must pay equal taxes whether they reside in West Virginia or in Illinois. This seems to make sense: Congress should not discriminate among taxpayers solely on the basis of their place of residence within the United States. Yet, the same rule, literally construed, promotes the second kind of "inefficiency" we identified at the beginning of this essay. How does it do so? By barring special taxes that Congress might impose upon the residents of one region in order to finance expenditures specially beneficial to that region. Thus, the uniformity clause would bar federal participation in an interstate compact designed to benefit Appalachia, even though some such compact would be "efficient." Because geographical uniformity is a doctrine that emerged only as a restraint on the taxing power, it is in one respect an arbitrary and burdensome restraint on the fiscal powers in general.

The technical barrier it poses to the interstate compact (41) emphasizes the need for laws that deal uniformly with both taxes and benefits.

Talk, of course, is cheap. This essay has made at best a feeble attempt to point the way toward legal reform. But there has still been value in showing how judges and lawmakers have failed to consider the benefit side carefully. And this is not to say that economists have been without guilt, either. At least since John Stuart Mill, Anglo-American students of public finance have taught that fiscal equity is essentially a question of ability to pay. Public expenditures have been regarded as unproductive and individual benefits as nonexistent or immeasurable. Thus, Mill defined equity as "equality of sacrifice" and advocated *laissez-faire*. (42) Edwin R. A. Seligman described "the principle that ought to govern the fiscal relations of the individual to the government" as "that of faculty or ability to pay." (43) And economists such as Sidgwick, Edgeworth, Pigou, and Henry Simons each distinguished between two kinds of public expenditures, those which provide individual benefits and those which serve the general welfare. In the case of the second and more important kind of expenditure, each described fiscal equity solely as fairness in the distribution of tax burdens. It would hardly be far-fetched to argue that these attitudes have influenced -- and muddled -- the thinking of the courts.

The view that public expenditures don't matter can be dangerous. It is one thing to observe that individual benefits from such expenditures are difficult to measure and that these benefits may be "general," insofar as they accrue to almost everyone rather than to a small, identifiable group. But it is quite another thing to speak as if the same benefits did not exist at all and as if the only beneficiary of public expenditures were some "general public" distinct from the individuals of whom it consists. To do so is to urge an "organismic" view of the fiscal process that can be used to justify almost any sort of discrimination. Since individual benefits do not exist, a loss of benefits causes no individual burden. Government may therefore make or withhold expenditures however it pleases in pursuing the "public interest."

Economists have not always neglected benefits. The classical Italian school of public finance emphasized their importance as did Wicksell and Lindahl. More recently, economists such as Professor Buchanan have emphasized that net benefits are the correct measure of individual welfare (44). Yet, there is no apparent tendency for these ideas to carry over to legal thinking.

Of course, no one suggests that the Constitution can or should

provide a rule specifying exactly how net benefits should be distributed throughout the country. The difficulties of measuring tax burdens and benefits as well as the piecemeal manner in which courts review legislation make this point obvious enough. But economists should not permit legislators and judges to confuse the logic of the symmetry norm with these practical difficulties. As we have seen, gray areas do seem to exist in which the application of the law to benefits ought to be clarified. Here economists can contribute by pointing out the nature and sometimes the size of the burden that is imposed by a withheld benefit. Occasionally, too, they can aid in the comparison of those effects of expenditure policy which are more or less "social" in nature with those which are purely individual. In short, they, like judges, can and should examine public expenditures with the same interest they have traditionally shown in examining the tax side of the fiscal process.

## NOTES

1. This paper is based on the author's doctoral dissertation, which was recently completed at the University of Virginia.
2. James M. Buchanan, The Public Finances (rev. ed.; Homewood, Illinois: Richard D. Irwin, Inc., 1965), p. 182.
3. See ibid., pp. 147, 181-82.
4. Ibid., p. 184.
5. Hylton v. United States, 3 Dallas 171 (1796).
6. Head Money Cases, 112 U. S. 580, 594 (1884).
7. E.g., Knowlton v. Moore, 178 U.S. 41 (1900), Flint v. Stone Tracy, 220 U.S. 107 (1911), and LaBelle Iron Works v. United States, 256 U.S. 377 (1921).
8. See above, note 7.
9. 240 U.S. 1 (1916).
10. Id. at 24-25.
11. Bolling v. Sharpe, 347 U.S. 497, 499 (1954).
12. Bell's Gap R.R. Co. v. Pennsylvania, 134 U.S. 232.

13. Id. at 237.
14. Gulf, Colorado, & Santa Fe Ry. Co. v. Ellis, 164 U.S. 150, 155 (1897).
15. 262 U.S. 447 (1923).
16. Id. at 487.
17. Id. at 482.
18. 160 U.S. 668 (1896).
19. Id. at 681.
20. 297 U.S. 1 (1936).
21. Id. at 66.
22. United States v. Boyle, 52 F. Supp. 906, 908 (N.D. Ohio 1943). (My italics.)
23. "The New Property," Yale Law Journal, LXXIII, No. 5 (April, 1964), 733-787, and "Individual Rights and Social Welfare: The Emerging Legal Issues," Yale Law Journal, LXXIV, No. 7 (June, 1965), 1245-1257.
24. Yale Law Journal, LXXIII, No. 5, 740.
25. Lynch v. United States, 292 U.S. 571, 577 (1934).
26. 363 U.S. 603 (1960).
27. Yale Law Journal, LXXIII, No. 5, 768.
28. 363 U.S. at 610-11.
29. Id. at 611.
30. Ivanhoe Irrigation Dist. v. McCracken, 357 U.S. 275, 295 (1958).
31. 330 U.S. 127 (1943).
32. Id. at 143.

33. Arthur Selwyn Miller, "Presidential Power to Impound Appropriated Funds: An Exercise in Constitutional Decision-Making," North Carolina Law Review, XLIII, No. 3 (April, 1965), 508.
34. Sharpless v. Mayor of Philadelphia, 21 Pa. 147, 168-169 (1853).
35. Allen v. Inhabitants of Jay, 60 Me. 124, 130-131 (1872).
36. See Loan Association v. Topeka, 20 Wall. 655 (1874).
37. Carmichael v. Southern Coal & Coke Co., 301 U.S. 495, 515 (1937).
38. See Aptheker v. Secretary of State, 378 U.S. 500 (1964), in which the Supreme Court invalidated a law denying passports to members of Communist organizations.
39. 363 U.S. at 612.
40. The medicare disclaimer is now under review by the courts.
41. The seriousness of this barrier is considered in Robert G. Dixon, Jr., "Constitutional Bases for Regionalism: Centralization; Interstate Compacts; Federal Regional Taxation;" George Washington Law Review, XXXIII (October, 1964), 84.
42. Principles of Political Economy, ed. W. J. Ashley (New ed.; London: Longmans, Green and Co., 1923), 804, 950.
43. The Income Tax (2d ed. rev.; New York: Macmillan Co., 1921), p. 22.
44. See Buchanan, "Federalism and Fiscal Equity," American Economic Review, XL (September, 1950), reprinted in Fiscal Theory and Political Economy (Chapel Hill: The University of North Carolina Press, 1960), p. 176.

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3.  
A METHOD FOR FINDING "ACCEPTABLE PROPOSALS"  
IN GROUP DECISION PROCESSES

By

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The purpose of this paper is to outline a method or algorithm for finding proposals on which all members of a group can agree. The method is confined to situations where the variables can be changed by any "small" amount and, where the group is attempting to decide on a change in the variables from some "existing situation." The method is applicable regardless of either the number of decision makers or number of variables. It can be used by anyone who is faced with the complicated task of finding a proposal on which all members of a decision making group can agree. Further, use of this method does not require a knowledge of the utility functions.

Consider several decision makers attempting to agree on a change in the magnitude of several variables, say  $(x_1, \dots, x_n)$ . There exists an infinity of possible changes in these variables. The problem is to find those changes which all (1) prefer to no change at all. There are many examples. A board of directors may be attempting to agree on changes in the composition of a portfolio which contains several different investment alternatives. A state legislature may be attempting to allocate a budget among several state programs. Examples could range from international problems to three boys in a room attempting to agree on changes in radio volume, brightness of lighting and room temperature.

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All of these examples are similar. In each case the problem is to find a change from an existing situation. (2) In each case the variables can take all values on the real line. Further, in each example the variables have the attributes of "public goods." (3) However, the "public good" nature of the variables is not a necessary condition for the application of the method. Nevertheless, since collective decision problems usually involve some type of externality, the discussion will be confined to such cases without loss of generality.

A possible change in the variables will be called a "proposal." A proposal would be "acceptable" to an individual if it would increase his utility. The problem is not to pick a particular proposal which is acceptable to all individuals. As will be shown, if there exists one such proposal, then there exists an infinity of them. The problem is simply one of showing a method by which all such proposals can be generated or by which it can be determined whether or not such proposals exist.

Consider a situation in where there are  $n$  variables  $X = (x_1, \dots, x_n)$  and  $m$  individuals. All variables are at some existing value  $\bar{X} = (\bar{x}_1, \dots, \bar{x}_n)$  called the "existing situation." (4) Each individual is characterized by a differentiable utility function

$$U^1 = U^1(x_1, \dots, x_n)$$

$$\vdots$$

$$U^m = U^m(x_1, \dots, x_n).$$

Now, a "proposal" is some proposed, small change in the variables  $y = (dx_1, \dots, dx_n)$ . If a particular proposal  $y^* = (dx_1^*, \dots, dx_n^*)$  would increase the utility of individual  $i$ , that is

$$(1) \quad \frac{\partial U^1}{\partial x_1} dx_1^* + \frac{\partial U^1}{\partial x_2} dx_2^* + \dots + \frac{\partial U^1}{\partial x_n} dx_n^* > 0$$

then  $y^*$  would be "acceptable" for individual  $i$ . The problem is to find all  $y$  such that

$$(2) \quad Ay > 0$$

where

$$A = \begin{bmatrix} \frac{\partial U^1}{\partial x_1} & \dots & \frac{\partial U^1}{\partial x_n} \\ \vdots & & \vdots \\ \frac{\partial U^m}{\partial x_1} & \dots & \frac{\partial U^m}{\partial x_n} \end{bmatrix} \quad y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} dx_1 \\ dx_2 \\ \vdots \\ dx_n \end{bmatrix}$$

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Notice that the  $i$ th row of the matrix  $A$  is the gradient of the utility function of the  $i$ th individual  $\frac{\partial U^i}{\partial x_1} \dots \frac{\partial U^i}{\partial x_n}$ . If a vector  $y^*$  satisfies (2) it means that  $y^*$  satisfies (1) for all  $i$  -- such a change,  $y^*$ , would increase the utility of all individuals. Hence, if a proposal satisfies (2), it is called an "acceptable proposal."

There are two problems now. The first is that of determining the various gradient vectors. This is not the same thing as obtaining utility functions. The second is that of outlining a method for finding the solutions to (2). The first problem is solved by asking individuals the proper questions and the second problem can be handled by linear programming techniques.

One way to obtain the gradient vector is to ask the participant to hand you an algebraic statement of his utility function. Were this necessary, however, the whole problem would not be very interesting. Actually, the gradient itself is not even needed. This is fortunate since it would necessarily contain an actual magnitude for marginal utility which would be just as hard to obtain as the utility function itself.

The gradient vector states the direction the variables should move in order for utility to increase most rapidly and the magnitude of utility increased if the variables are so changed (the change being "small"). Ignoring magnitude the gradient direction is the direction of an individual's most preferred proposal. We can now make a very important observation. Multiplying (1) by any positive number does not change the sign of the inequality. Thus all we need to know to solve our problem is the gradient direction. There is no need to know the magnitude. This means we do not need to know the actual marginal utilities.

Two ways to obtain the gradient direction are readily available. The first method would be one of obtaining the marginal rate of substitution for individual  $i$  ( $i = 1, \dots, m$ ), between each variable in the set  $(x_1, \dots, x_n)$  and some external good. An external good is one which is not subject to change by the decision making body, i.e., not one of  $(x_1, \dots, x_n)$ . For example, one could discover how much each individual would pay (positive or negative) in terms of money for a small change in each of the variables. The result for individual  $i$  would be a vector such as

$$(3) \quad \frac{\partial U^i / \partial x_1}{\partial U^i / \partial M} \quad \frac{\partial U^i / \partial x_2}{\partial U^i / \partial M} \quad \dots \quad \frac{\partial U^i / \partial x_n}{\partial U^i / \partial M}.$$

Observe that this is simply the gradient again multiplied by a positive number  $(\frac{1}{\partial U^i / \partial M})$ . (5) Notice that multiplying (1) by a positive number does not change the sign. Hence we can replace the gradients in (2) by the vector (3) and get identical results.

A second way of obtaining the gradient direction is to simply ask the decision makers what change they would prefer the most. However, since the method proposed here has greatest applicability where only "small" changes in the variables are considered, each individual should be asked to reveal that change in the variables that he "most prefers" which satisfies

$$(4) \quad \left( \sum_{i=1}^n dx_i^2 \right)^{\frac{1}{2}} = \epsilon > 0$$

This method of "normalizing" does not appear possible in the first procedure. Hence with the first method care must be taken to assure that is actually marginal rates of substitution which are obtained. (6) In any case if  $\epsilon$  is sufficiently small the resulting vector  $(dx_1 \dots dx_n)$  will express the gradient direction and can be used in (2) in place of the actual gradient. For each decision maker, such a most preferred direction is obtained and this vector replaces that row in (2) occupied by his gradient.

The results can now be summarized. For each individual a most preferred alternative or direction, has been obtained. For individual  $i$  this vector is denoted by  $(a_{i1} a_{i2} \dots a_{in})$ . Since  $(a_{i1} \dots a_{in}) = \lambda_i (\frac{\partial U^i}{\partial x_1} \dots \frac{\partial U^i}{\partial x_n})$ ,  $\lambda_i > 0$ , we know

$$(5) \quad \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \vdots & & \vdots \\ a_{m1} & \dots & a_{mn} \end{bmatrix} \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} \lambda_1 \frac{\partial U^1}{\partial x_1} & \dots & \lambda_1 \frac{\partial U^1}{\partial x_n} \\ \vdots & & \vdots \\ \lambda_n \frac{\partial U^n}{\partial x_1} & \dots & \lambda_n \frac{\partial U^n}{\partial x_n} \end{bmatrix} \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix}, \text{ for some set of } \lambda_i\text{'s, } \lambda_i > 0.$$

So, we can use, unambiguously, the matrix on the left in place of the matrix on the right. For any vector  $y$ , the inner products on the left

will be greater than zero if and only if the corresponding inner products on the right are greater than zero. We thus want to find all  $y$  such that

$$(6) \quad \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \vdots & & \vdots \\ a_{m1} & & a_{mn} \end{bmatrix} \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} > 0$$

or in more compact notation

$$(6) \quad Ay > 0.$$

Once the gradient directions are determined the problem is that of finding the solutions to (6). If no solutions exist it simply means that there does not exist an "acceptable proposal." Solving this problem is simply a linear programming problem. If solutions to (6) do exist they are the interior of a convex polyhedral cone. Consequently, if there is one solution, there is an infinity of solutions. The problem is one of finding the extreme edges of this cone. It is sufficient to find a point on each extreme edge because any strictly positive combination of such points will be an "acceptable proposal."

First, it must be determined whether or not a solution exists to (6). David Gale has outlined a procedure for such problems so it is unnecessary to review it here. (7) We can proceed, then, on the assumption that there does exist solutions to (6).

Traditional linear programming techniques require that each of the variables be constrained to be greater than or equal to zero. Since the variables in (6) are unrestricted in sign, it is necessary to re-define them as

$$(7) \quad dx_i = dx_i' - dx_i'' \quad dx_i' \geq 0 \quad dx_i'' \geq 0.$$

By substituting (7) into (6) the problem now becomes one of finding the semipositive solutions to

$$(8) \quad \hat{A}y > 0 \quad \hat{y}_i \geq 0$$

where

$$\hat{A} = \begin{bmatrix} a_{11} & -a_{11} & a_{12} & -a_{12} & \dots & a_{1n} & -a_{1n} \\ \cdot & & & & & & \\ \cdot & & & & & & \\ \cdot & & & & & & \\ a_{m1} & -a_{m1} & a_{m2} & -a_{m2} & \dots & a_{mn} & -a_{mn} \end{bmatrix}$$

$$a_{ij} = \lambda_i \frac{\partial U^i}{\partial x_j} \quad \lambda_i > 0$$

$$\hat{y} = (\hat{y}_1, \dots, \hat{y}_{2n}) = (dx_1', dx_1'', dx_2', dx_2'', \dots, dx_n', dx_n'')$$

or

$$\hat{y}_1 = dx_1' \quad \hat{y}_2 = dx_1'', \dots, \text{etc.}$$

All solutions to (8) lie in the interior of the cone of solutions to

$$(9) \quad \hat{A}y \geq 0.$$

So, all that need be done, if it has been determined that there are solutions to (6) and hence (8), is find the extreme solutions to (9). All solutions to (6) and (8) can then be found by taking all strictly positive linear combinations of the extreme solutions to (9). This can be done by first defining a hyperplane that will truncate the solutions to (9). The convex cone of solutions thus becomes a convex polyhedron. The extreme points can then be found by undertaking  $n$  maximum problems and  $n$  minimum problems.

The hyperplane is defined by

$$(10) \quad \sum_{i=1}^{2n} \hat{y}_i \leq k > 0.$$

The problem is then one of finding

$$(11) \quad \begin{array}{ll} \max dx_j & \text{subject to} \\ \hat{A}y \geq 0 & \\ \sum_{i=1}^{2n} \hat{y}_i \leq k & \end{array}$$

$$\hat{y}_i \geq 0$$

and  $\min dx_j$  subject to

$$\hat{A}y \geq 0$$

$$\sum_{i=1}^{2n} \hat{y}_i \geq 0$$

$$\hat{y}_i \geq 0 \quad j = 1, \dots, n.$$

Let  $y_*$  be the solution to the first of the  $2n$  problems. That is, using (7),  $y_*$  is a vector indicating that  $(dx_1, \dots, dx_n)$  for which  $dx_1$  is a maximum. The set  $E = (y_*, \dots, y_{2n}^*)$  is a set such that each element is a solution to a different maximum (minimum) of (11), and the set contains all such solutions. Now  $E$  contains all extreme edges of the solutions to (9) and, in general, some acceptable proposals. There is no need to separate these because any strictly positive linear combination of all the elements of  $E$  will yield an "acceptable proposal." That is, the "acceptable proposals" are those in a set  $S$  where

$$S = \left\{ y \mid \sum_{i=1}^{2n} \lambda_i y_i^* = y, \lambda_i > 0 \right\}.$$

The set  $S$ , which is generated by allowing the  $\lambda$ 's to take all positive values is the set of all "acceptable proposals" assuming that acceptable proposals exist. It is important to realize that before the method for finding  $S$  is used it must be established that (6) has solutions. The system (9) can have solutions even though (6) does not and (9) will always have non-trivial solutions if the number of variables is greater than or equal to the number of people. So even when (6) has no solution, the method would generate a set  $S$ , but it would be the case that

$$Ay = 0 \quad \text{for all } y \in S.$$

The method can be shown graphically with the aid of Figure 1. The appendix outlines the computations involved in solving the same example. The point  $\bar{x}$  is the "existing situation" and  $a_1 = (-1 \ 1)$  and  $a_2 = (2 \ 1)$  are the "most preferred" directions of individuals 1 and 2 respectively. The lines  $b_1$  and  $b_2$  identify vectors such that  $a_i \cdot b_i = 0$ . The shaded area is the set of "acceptable proposals,"  $S$ , which we wish to find. That is  $a_i \cdot y > 0$ ,  $i = 1, 2$  for all  $y \in S$ .

The large triangle is the hyperplane defined by (10) and transformed by (7) into the  $x_1, x_2$  plane. The first problem defined by (11) is to find that change in  $x_1$  and  $x_2$  which maximizes the change in  $x_1$  subject to the outlined constraints. The solution is  $c = (3 \ 3)$ . That change in  $x_1$  and  $x_2$  which minimizes the change in  $x_1$  is found next. The solution is  $e = (-2 \ 4)$ . Then the solutions to  $\max dx_2$  and  $\min dx_2$  are  $d = (0 \ 6)$  and  $f = (0, 0)$  respectively. These solutions are the elements of  $E$ . The shaded area can now be generated by taking all strictly positive linear combinations of these solutions. That is, all  $(dx_1 \ dx_2)$  found by the expression

$$(dx_1 \ dx_2) = \lambda_1 (3 \ 3) + \lambda_2 (-2 \ 4) + \lambda_3 (0 \ 6) + \lambda_4 (0 \ 0)$$

$$\lambda_i > 0$$

are "acceptable proposals."

The method for finding acceptable proposals seems most attractive in that it offers a computational method in a most traditional framework. There are, however, several qualifications that must be made. For example, individuals could gain by giving a false "most preferred proposal" if the method of deciding among the set of "acceptable proposals" is known and the "most preferred proposal" of other individuals is known. This type of falsification may be of little use in large groups where an individual knows little or nothing about the utility function of the other individuals.

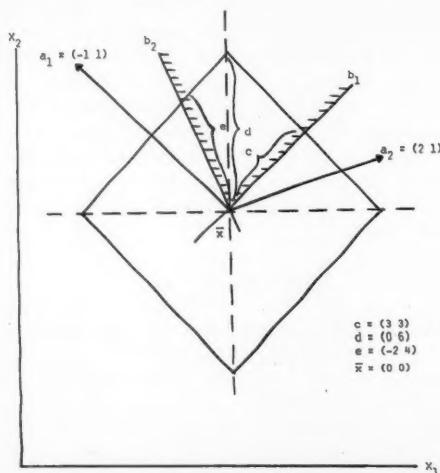


Figure 1

Even though the method can give a set of "acceptable proposals" it is possible that once a proposal is picked it may be weighted too heavily. In other words, the proposal may go "too far." An example of this is shown in Figure 2. The "most preferred proposals" for individuals 1 and 2 are the vectors  $a_1$  and  $a_2$  respectively. The curves  $I_1$  and  $I_2$  are indifference curves for 1 and 2 respectively. The extreme edges of the space of "acceptable proposals" are  $b_1$  and  $b_2$ . In principle, any positive combination between  $b_1$  and  $b_2$  (the shaded region) would be an "acceptable proposal." But any vector in this space could go "too far" in two respects.

First, it may go beyond that which is desired by some individual. For example, suppose a proposal such as  $c$  was chosen. If it was "expanded" to a point such as  $c'$  all individuals would prefer it to the initial position  $\bar{x}$ . But, if it were "expanded" to point  $c''$ , individual 1 would no longer prefer it to  $\bar{x}$ . It was for this reason that the space of "acceptable proposals" was confined to those "directions" which would strictly increase all utilities. If someone is "indifferent," the expression in (1) would equal zero. But, he would be against any finite move in the indifferent direction unless his indifference curves were linear. Such would be the case with a motion in the direction  $b_1$ . Individual 1 would be indifferent according to (1) but a finite move in that direction would clearly decrease his utility.

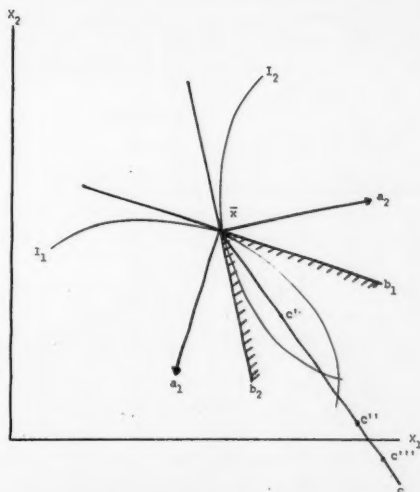


Figure 2

The second way in which a motion can go "too far" is by passing beyond some constraint. Again, if motion  $c$  is expanded to  $c''$ , negative amounts of  $x_2$  would be required. Presumably, this is impossible. So, the various constraints, such as budget constraints, positive commodities, etc., must be considered when considering the "distance" which a motion can be taken. Of course, there are many convenient ways to include these constraints. It may be noted that if the point  $\bar{x}$  lies on a constraint initially, the gradient of this constraint can be taken as the gradient of another individual and included in the matrix  $A$ . In the case of a linear budget constraint the gradient used would be the negative of the price vector.

In spite of these qualifications on the set of "acceptable proposals" an important global result can be deduced. If the utility functions are concave as is usually presupposed, then the set of "acceptable proposals" contains all acceptable proposals. Even though, for large changes in the variables, the set  $S$  contains some proposals which are not acceptable, all proposals which are not in  $S$  are not acceptable.

#### APPENDIX: NUMERICAL EXAMPLE

A numerical example should make the computational method clear. Assume there are two individuals 1 and 2, and two commodities  $x_1$  and  $x_2$ . The gradient directions for the two individuals are  $a_1$  and  $a_2$  for 1 and 2 respectively. These are

$$a_1 = (-1 \ 1)$$

$$a_2 = (2 \ 1).$$

According to (6) we want all solutions to

$$(12) \quad \begin{bmatrix} -1 & 1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} dx_1 \\ dx_2 \end{bmatrix} > 0.$$

Using the procedure described by (7) this becomes

$$(13) \quad \begin{bmatrix} -1 & 1 & 1 & -1 \\ 2 & -2 & 1 & -1 \end{bmatrix} \begin{bmatrix} \hat{y}_1 \\ \hat{y}_2 \\ \hat{y}_3 \\ \hat{y}_4 \end{bmatrix} > 0 \quad \hat{y}_1 \geq 0.$$

Since this example was (conveniently) constructed such that solutions exist the procedure for testing this will be skipped. (8)

Following the rule described by (10) we define a hyperplane

$$(14) \quad \sum_{i=1}^4 \hat{y}_i \leq 6$$

and proceed to undertake the first maximum problem defined by (11), i.e.,

$$(15) \quad \max dx_1 = y_1 - y_2$$

subject to

$$(16) \quad \begin{aligned} -1 \hat{y}_1 + 1 \hat{y}_2 + 1 \hat{y}_3 - 1 \hat{y}_4 - z_1 - 0 z_2 - 0 z_3 &= 0 \\ 2 \hat{y}_1 - 2 \hat{y}_2 + 1 \hat{y}_3 - 1 \hat{y}_4 - 0 z_1 - 1 z_2 - 0 z_3 &= 0 \\ 1 \hat{y}_1 + 1 \hat{y}_2 + 1 \hat{y}_3 + 1 \hat{y}_4 - 0 z_1 - 0 z_2 + z_3 &= 0 \\ y_1, z_1 &\geq 0 \end{aligned}$$

where  $z_i$  are the slack variables. (9) Notice that  $\max dx_1$  is equivalent to  $\min -dx_1$  and the first two equations in (16) are unchanged if multiplied by  $-1$ . With these observations the problem is placed in a standard programming tableau.

Tableau 1

$\hat{y}_1$	$\hat{y}_2$	$\hat{y}_3$	$\hat{y}_4$	$z_1$	$z_2$	$z_3$	constants
①	-1	-1	1	1	0	0	0
-2	2	-1	1	0	1	0	0
1	1	1	1	0	0	1	6
-1	1						$dx_1 = 0$

Observe that the problem is at a basic feasible solution as will always be the case. The first pivot is on the circled element. The resulting tableau is:

Tableau 2

$\hat{y}_1$	$\hat{y}_2$	$\hat{y}_3$	$\hat{y}_4$	$z_1$	$z_2$	$z_2$	constants
1	-1	-1	1	1	0	0	0
0	0	-3	3	2	1	0	0
0	2	(2)	0	-1	0	1	6
0	0	-1	1	1	0	0	$dx = 0$

Tableau 3

1	0	0	1	1/2	0	1/2	3
0	3	0	3	1/2	1	3/2	9
0	1	1	0	-1/2	0	1/2	3
0	1	0	1	1/2	0	1/2	$dx = 3$

Since all entries on the last row are positive, we are at a minimum. The result is  $\hat{y}_1 = 3$ ,  $\hat{y}_3 = 3$ ,  $\hat{y}_2 = \hat{y}_4 = 0$ . Or,  $dx_1 = 3$ ,  $dx_2 = 3$  as shown by c on Figure 1. This solution is an element of E.

Now, as dictated by (11) we proceed to  $\min dx_1 = \hat{y}_1 - \hat{y}_2$ . The tableau is

Tableau 1

1	-1	-1	1	1	0	0	0
-2	(2)	-1	1	0	1	0	0
1	1	1	1	0	0	1	6
1	-1						$-dx_1 = 0$

Tableau 2

0	0	-3/2	3/2	1	1/2	0	0
-1	1	-1/2	1/2	0	1/2	0	0
2	0	3/2	1/2	0	-1/2	1	6
0	0	-1/2	1/2	0	1/2	0	$-dx_1 = 0$

Tableau 3

2	0	0	2	1	0	1	6
-1/3	1	0	4/6	0	1/3	1/3	2
4/3	0	1	1/3	0	-1/3	2/3	4
2/3	0	0	4/6	0	2/6	1/3	$-dx_1 = 2$

The solution is  $\hat{y}_1 = \hat{y}_4 = 0$ ,  $\hat{y}_2 = 2$ ,  $\hat{y}_3 = 4$ . Thus the second element of E is  $dx_1 = -2$ ,  $dx_2 = 4$  as shown by e on Figure 1. By continuing the process, it can be shown that the solution for  $\max dx_2$  is  $dx_1 = 0$ ,  $dx_2 = 6$  (shown by c on Figure 2). The solution for  $\min dx_2$  is  $dx_1 = 0$ ,  $dx_2 = 0$ .

Any solution to (12) can be found as a strictly positive linear combination of the elements of E and any strictly positive combination of the elements of E is a solution to (12). For example

$$2 \begin{bmatrix} 3 \\ 3 \end{bmatrix} + 4 \begin{bmatrix} -2 \\ 4 \end{bmatrix} + 3 \begin{bmatrix} 0 \\ 6 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} -2 \\ 40 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 40 \end{bmatrix} \quad \begin{array}{l} 2 + 40 = 42 \quad 0 \\ -4 + 40 = 36 \quad 0 \end{array}$$

Thus, the proposal  $(-2 \quad 40)$  is "acceptable."

## NOTES

- \* I wish to thank Antonio Comacho, Cliff Lloyd, William Starbuck and Akira Takayama for their comments. Responsibility for error, I reserve for myself.
1. Of course, one may not wish to have a proposal to which all agree. Perhaps an agreement between some subset of all individuals is all that is required (perhaps a majority). The analysis pertains to those individuals whose agreement is sought.
  2. The "existing situation" could be the point  $(0, \dots, 0)$ , of course.
  3. P. A. Samuelson, "The Pure Theory of Public Expenditures" Review of Economics and Statistics, XXXVI, 1954, pp. 378-89.
  4. See footnote 2.
  5. We choose  $M$  such that  $\partial U^i / \partial M$  is positive. It may be noted that for a particular individual we use the same "numeraire" for each variable. There is no need, however, to use the same "numeraire" for all individuals. For one individual you can find the marginal rates of substitution between the variables and dollars. For another individual the numeraire could be coconuts. In any case, the numeraire must be external unless the actual marginal utility for the numeraire is known.
  6. "Normalization" is necessary to prevent confusion between a "most preferred direction" and a preferred point. For example, going a "short distance" in the most preferred direction may not be preferable to going a "long distance" in some other direction. "Normalization" keeps the possible "distances" constant among alternative directions. Further, this procedure only provides an approximation of the gradient direction which approaches the gradient direction as  $\epsilon \rightarrow 0$ .
  7. David Gale, The Theory of Linear Economic Models (McGraw-Hill, New York), 1960, pp. 121-23. Notice that if and only if there exists a solution to (6) then there exists a solution to

$$Ay \geq b$$

where  $b$  is any positive number.

8. See footnote 7.
9. The procedure used here is the same as that found in G. Dantzig, Linear Programming and Extensions, Princeton University Press: Princeton, 1963.

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## ALTERNATIVE VOTING RULES AND LOCAL EXPENDITURE: THE TOWN-MEETING VS. CITY

By

Harvey J. Wheeler

### 1. Introduction

Does "Balkanization" of governmental units along functional and territorial lines impair the attainment of desired levels of public goods expenditure? Is the government budget too small in a democracy? Do the strategic realities -- epitomized by the "prisoners' dilemma" model of game theory -- serve to over-stimulate governmental expenditures? Is the trained technician (city manager) markedly more efficient than the political entrepreneur (mayor)? Do local benefit-cost externalities result in a global curtailment of governmental functions?

That these and similar questions have been posed is an indication of growing interest in the mechanics of collective choice. Unfortunately, the only thing more vexing than the "babble of logicians" is the quality of empirical evidence which can be brought to bear on these questions.

The present paper outlines an empirical study which attempts to limit the range of uncertainty on some of the above question. (1) This paper will begin with brief vignettes of hypotheses which have been offered by various authors. These will provide a setting for the study under review. Next, there will be a brief description of the data which was derived in the study. After treatment of the derived data, the findings will be examined in relation to seminal theories and results of other tests. Throughout, an emphasis will be placed upon technical problems and ambiguities of interpretation which are involved in such tests.

### 2. The Setting of the Study

One bit of ephemera which triggered response in the late 1950's

was the claim of underconsumption in the public sector, which is now part of the folklore of the educated. A good emerging from the claim has been a heightened interest in the mechanics of collective choice; and work of a substantive nature in this area is epitomized in the questions posed in the introduction of this paper.

One class of work, which is of interest in examining the findings of the study, is concerned with information deficiencies as they affect the voting process. For a purely deductive approach to information deficiencies as they distort public goods consumption, we may cite Anthony Downs. (2)

The analysis as set forth by Downs may be fairly -- but not adequately -- presented as follows. The citizen is in a state of zero ignorance when he knows (1) all actual or potential items in the budget of each party and (2) the full benefits and costs of each item. But failing to " ... see how acquiring detailed political data will make him better off ... a rationally calculating attitude about the use of time leads him to political ignorance." (3) But for Downs this is a special type of rational ignorance. First, it is not absolute ignorance which is vital for public expenditure distortions; it is rather only the degree of ignorance relative to that of market-implemented decisions. Second, due to the lack of quid pro quo emerging from the collective nature and redistributive properties of public expenditures; and due to the lack of selectivity emerging from the coercive nature of dealing in public goods, " ... no one ever attains marginal equilibrium in his dealings with the government." (4) Third, in this disequilibrium situation the very remoteness and uncertain nature of benefits from government actions constitute sources of crucial distortions. Fourth, the distortions consist of an under-evaluation of government benefits in comparison with private benefits and the overevaluation of government cost in comparison with private cost.

Thus, Downs approximates partial ignorance as a relative lack of knowledge of the full benefits and costs of each item in budgets. (See (2) above). From a far fuller elaboration of the above, Downs concludes:

Therefore every citizen believes that the actual government budget is too large in relation to the benefits he himself is deriving from it. (5)

A conclusion which is diametrically opposed to that of Downs emerges from a deductive analysis presented by Julius Margolis. (6) Although the form of the analysis presented by Margolis differs

drastically from the Downs analysis, the source of distortions in public goods expenditure traces back to information deficiencies. Whereas Downs expects differential ignorance to produce curtailment of government expenditures, Margolis is led to the conclusion that curtailed expenditures result from the "balkanization" of metropolitan areas into smaller governments. For Margolis, smaller governments dispell ignorance while complex governments harness the voters' ignorance to achieve consensus. Margolis summarizes the conclusion as follows:

The consequence of the forces which expand the set of acceptable programs is to permit the government of the city greater freedom in seeking out compromises. It is easier for the government to assess taxes and it is easier for the government to expand services than if only rational self-interest ruled. Ignorance and the acceptance of majority rule permit the resolution of conflicts by the political processes of persuasion and negotiation, while knowledge of consequences and their implications for one's own self-interest would lead to frustration of policy by focusing on possibly irreconcilable conflicts. (7)

Although it was contested by the discussants of the paper, Margolis does present empirical evidence in support of his thesis.

A second class of work which is related to the present study, is concerned with externalities and their effects upon expenditure levels. Burton A. Weisbrod has suggested a global (national) underconsumption of education with rational local choice as the source of the alleged bias. (8) This distortion results from an asymmetrical response of voters to "spill-outs" of educational benefits which have been financed locally and "spill-ins" of education benefits which have been financed elsewhere. According to Weisbrod, local communities would little alter their educational expenditures at the margin as a result of the net import of educational benefits which have been financed elsewhere. Yet local communities would reduce their educational expenditures significantly where local sacrifices would accrue to the benefit of residents of other communities. (9)

Two issues of some weight are revealed in the above survey. First, we may note a marked contrast in conclusions which are drawn from the analyses of voter ignorance. Second, the efficacy of decentralized, political decision-making is challenged by the suggested voter response to benefit-cost "spill-overs." Somewhat broader and more technical is the question of voter performance under alternative voting rules. The weight and interest of these matters would suggest that further tests would be warranted.

The study under survey consists of a comparative analysis, by means of various cross-sectional techniques, of voting performance under two different voting structures. The two voting structures to be compared are the direct democracy of the town-meeting as contrasted to the representative democracy of the city form of government. Operationally, the distinction between these forms of government is confined to the setting in which the political consensus is achieved. In the town, decisions are made in open public meeting, with full debate, and issues are decided by voice or hand vote. Thus, the town-meeting form approximates Down's state of zero ignorance. Under the city form the more familiar mechanics of representative government become operative. Under these circumstances we would expect a greater degree of ignorance on the part of the voter. Finally, the Margolis distinction between "packages," -- toward which the voters' decisions are directed --, are clearly contrasted between simple (individual issues) and complex (the political entrepreneur) under the two structures. Thus, data drawn from voter performance under town-meeting versus city forms of government provide an incisive dichotomy precisely along the lines of differential knowledge on the part of voters.

The standardized data series' which will be described next also provide an opportunity for a crude test for Weisbrod's suggested asymmetrical voter response to benefit-cost externalities.

### 3. The Derived Data

The study being outlined consists of two distinct parts; a standardized body of data and the execution and evaluation of tests upon that data. We will examine the derived data here.

Annual and biennial educational experience in 75 communities in the state of Maine covering a period of 95 years was standardized for testing. The standardization was performed to derive the three variables; Average Daily Attendance for the Year, Locally-voted Current Expenditure per Pupil in Average Daily Attendance, and the Local to State Ratio of such Per Pupil Expenditure. After alignment of the financial accounts, from 9 to 14 items of input to a computer program were used to generate each annual triad of derived data for each community. This series of data for each community and for each year (or every other year) covered the period 1849-50 to 1944-45. However, this was possible only on an elementary school basis early in the period, and later on a combined elementary and secondary school basis. This limitation required that a second series of data be generated extending the combined elementary and secondary school

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data for selected communities. There resulted two series of 70 years each with an overlap of approximately 50 years. Specifically, the elementary school data for all 75 communities spans the period 1849-50 to 1920-21, whereas the combined elementary and secondary school data for 45 selected communities spans the period 1872-73 to 1944-45. Also, by way of coverage, the series for each community are on an annual basis except for the earliest and latest years of the 95 year period when biennial reporting occurred.

During the latter lapse from annual into biennial reporting which dates from 1920-21 to 1944-45, the source data also failed to reflect the duration of attendance. This necessitated the derivation of data for this period on an annual rather than a daily expenditure basis. Further, since expenditure data for the early years was not shown, the study used a locally-voted receipts figure in lieu of a locally-voted expenditure figure. The source data proved more intractable with respect to concepts than with respect to these matters of coverage. Throughout the span of nearly a century the then-contemporary concept of "current expenditures" was accepted where more uniform standardization was not possible. Of course, this resulted in series built from concepts which were gradually undergoing change.

These mutations in coverage and concepts then constitute the major reason for the use -- not of the absolute expenditure figures -- but rather of ratio of each community's Locally-voted Expenditure per Pupil in Average Daily Attendance to that of all reported communities. This simple but practicable device also serves to minimize the influences of weather, wars, epidemics, alternations in the general level of economic activity, price level changes, state aid programs, etc. which could be expected to affect all communities in common. We are left then with the expenditure performance of a particular community expressed relative to the performance of a "representative community."

#### 4. The Tests and Findings

Two types of experiments were performed on the data: the one, a simple comparison of average expenditures and the other, a sequence of linear, multiple regression exercises. These will be discussed in turn.

First, for the simple comparisons an arbitrary selection criterion was applied to select observations for study. The observations representing each form of local government, viz., town-meeting and city were grouped. Then values of the selected and grouped

expenditure ratios were averaged for mean and median expenditures. Next, the differences between average expenditure ratios were subjected to standard significance tests. These tests were performed on each of the overlapping series cited above as well as on each series by decade.

The only elaboration needed here concerns the arbitrary selection criterion. We wish to exclude from the comparisons the smallest communities which could not conceivably operate as cities as well as the largest communities which could not conceivably operate as towns. Further, that which is "conceivable" by way of possible size to qualify each type for comparison changed substantially over time. To get a selection criterion which acknowledges the viability in any era of a particular form of government in terms of its size, the following rule was applied. For a town to qualify as a potential city there must have been a city in that year at least as small. Similarly, for a city to qualify as a potential town there must have been a town in that year at least as large.

The results of the comparisons are similar for the two series. In the later decades a significant difference emerges between the respective mean and median expenditures by towns and cities. Communities qualifying by the arbitrary selection criterion reveal that cities came to spend less on average than did towns.

In so far as the voters in town-meeting decisions operate with fuller knowledge than do those in representative-governed cities, then the results of the comparisons would support the Downs hypothesis and cast doubt upon the Margolis hypothesis. In so far as we may heroically accept the popular notion that the town-meeting produces decisions which more accurately reflect the tastes of participants, then the more complex form -- rather than the simple form -- yields sub-optimal expenditure performance. The disquieting feature of these simple comparisons is the fact that the selected observations come precisely over the range of apparent increasing returns-to-scale of school system. Since the selection criterion is sensitive to the aberrant case -- i.e. a city which is atypically small or a town which is atypically large --, the emerging significance difference in expenditure ratios may be a product of the exploitation of returns-to-scale combined with faulty criterion. However, significance tests over these observations by class interval fail to establish such a distortion in the criterion.

The second type of experiment performed on the data consists of a sequence of linear, multiple regression exercises. To moderate the variation in the data, and to align the school data with population

census data, the variable to be explained was the decadal average of the expenditure ratios. The patterns of the regression exercises was the same as that for the simple comparisons of the ratios. That is, pooled regressions were run for each of the 70 year series; and separate regressions by decade were run for each series.

The explanatory variables were extremely crude and exploratory in nature. Briefly, the explanatory variables were directed toward four sources of influence upon the expenditure levels. These four sources of influence were the educational production function, migration, "success" and form of government. The influences upon the expenditure ratios which operate through the educational production function were sought by means of: a) Average Daily Attendance in a reciprocal function to investigate "returns-to-scale"; b) duration of attendance and proportion of students in high school where these were appropriate; and c) alternate variables seeking the role of "capacity-of-school-system" under the impact of attendance changes. Migration data is not available and hence absolute population change data was used in its place. As will be seen, the mode and intent of its use is such that this substitution is not as cavalier as it might seem. In quest of an index of differential "success" of a community a compound, cumulative, relative growth rate of population was also incorporated into the regressions. Finally a variable to denote form of government -- town-meeting or city -- was included. However crude the explanatory variables may be, the regressions provide for the inclusion of routine variables of the educational production function along with the variable for alternative voting structures.

The regressions by decade tended to be significant at the 1% or 5% level of significance during the 50 year overlap of the two series and uniformly not significant at the extremes of the series. However, the values of  $R^2$  or the percentages of the corrected sum of squares explained were low, ranging from 28 to 48 over the significant regressions. The low explanatory power of the regressions reflects the difficulty of generating local government variables which span nearly a century.

The significance tests of the parameters reveal that apparent returns-to-scale along with differential duration of attendance and/or the proportion of students in high school have been the more important influences. The variable denoting alternative voting structures, i.e., town-meeting or city, yields an acceptable level of significance only in the earliest regression taken over the 1860's. Further, the significance of the voting-structure variable deteriorates over time. This result is in sharp contrast to the results of the simple comparisons described above. There a significant difference in expenditure

performance between voting structures seemed to have emerged over time. The regression results now tend to confirm the suspicion that a faulty selection criterion in the simple comparisons confounds the influence of returns-to-scale with the influence of voting structures and differential ignorance of voters.

Thus, when this extensive body of data is tested in a fashion which combines more routine variables with the variable for alternative voting structures (with their differential degrees of voter ignorance), neither the Downs or the Margolis hypothesis receives support. Apparently information deficiencies have not introduced distortions in the thousands of political decisions encompassed by this data.

We may now turn to the Weisbrod hypothesis which challenges the efficacy of decentralized, political decision-making. To test this hypothesis, Weisbrod must resort to state-wide educational expenditure data in an attempt to test local voter response. The test, taken over observations of the 1950's, consists of a regression featuring migration variables. After more routine explanatory variables, the migration variable is introduced as two variables according to whether it is positive or negative. This technique enables a test for the asymmetrical expenditure response which is expected to result between out-migration and in-migration circumstances. Using state-wide data, Weisbrod finds confirmation of his hypothesis. (10)

Whereas Weisbrod must resort to state-wide migration data to test local expenditure response, we are able to test local expenditure response with local data. Unfortunately, the data available is for population change and not for migration.

It would be helpful to know something of what this substitution entails. Since the 75 communities selected for a near-century of study were those of 2,500 or more in population as of 1960, we may surmise that such a selection by availability would yield a list of communities with greater-than-average population growth rates. Indeed, this is confirmed by the fact that only one community out of fifty-four for which cumulative, relative, compound growth rates were computed showed a negative rate in any decade. This would indicate that the experience of these communities was dominated by in-migration from the rural areas.

We may then inquire whether such positive population growth operated significantly on the expenditure ratios. The regression parameters reveal no such significant influence either for absolute percentage increase in population or for differential, cumulative,

compound change. Such a lack of influence of in-migration on expenditure levels is in accord with Weisbrod's thesis.

But any community experiencing negative population change within a decade or over several decades was bucking a strong trend toward positive growth. We may surmise that such circumstances reflect out-migration rather than increases in death rates or decreases in birth rates. The weight of this benefit-cost "spill-over" thesis then rests upon a finding of a reduction in expenditures in response to out-migration.

The study reveals no significance on a two-tail test in any decade whether the regressions were run on elementary school data along or on the combined elementary and secondary school data. The sign of the parameter is correct in nine of the thirteen decadal regressions. Following Weisbrod, if we interpret this as signifying that the "model" has "predicted" the sign correctly and apply a single-tail test, then only two out of nine correctly predicted parameters are significant at better than the 5% level. Thus, this study provides scant (if any) support for the thesis of a global bias toward underinvestment in education due to benefit-cost "spill-overs."

## 5. Conclusion

Three hypotheses, which have been advanced by students of collective decision-making, have been subjected to crude test with data spanning nearly a century. That none of the three finds confirmation or refutation suggests that both our understanding of these processes and the refinement of available tests leave much to be desired. The empirical results surveyed here, as well as those of other writers, consistently yield highly tentative interpretations. At root many of the ambiguities are a product of the identification problem. (11)

## NOTES

1. The study to be outlined was developed as a doctoral dissertation for the University of Virginia. See Harvey J. Wheeler, An Empirical Test for a Bias Toward Underconsumption in Alternative Voting Structures, the University of Virginia, Charlottesville, Virginia, August 1966.
2. Anthony Downs, "Why the Government Budget is Too Small in a Democracy," World Politics, July 1960, pp. 547-561.

3. Downs, *op. cit.*, p. 544.
4. *Ibid.*, p. 548.
5. *Ibid.*, p. 550.
6. "Metropolitan Finance Problem: Territories, Functions, and Growth," Public Finances: Needs, Sources, and Utilization. A Conference of the Universities - National Bureau Committee for Economic Research, Princeton University Press, Princeton, N. J. 1961, pp. 229-293.
7. "Metropolitan Finance Problems: Territories, Functions, and Growth," *op. cit.*, p. 243.
8. Burton A. Weisbrod, External Benefits of Public Education, Industrial Relations Section, Department of Economics, Princeton University, Princeton, N. J., 1964.
9. For an inconclusive criticism of Weisbrod's behavioral assumption, see: A. G. Holtmann, "A Note on Public Education and Spillovers Through Migration" The Journal of Political Economy, Vol. LXXIV, No. 5, (October, 1966), pp. 524-525. Holtmann's criticism reflects the virgin state-of-the-art in the study of collective choice.
10. In conjunction with his criticism of Weisbrod's behavioral assumption, Holtmann suggests an alternative interpretation of Weisbrod's empirical results. *Ibid.*, footnote 1, p. 524. The study under survey and the present paper attempt to replicate the Weisbrod experiment to see if it is supported by the available data. Hence, his interpretation of the findings is accepted for the present.
11. Holtmann cites identification as the problem in his suggested reinterpretation of Weisbrod's regression findings. *Ibid.*, p. 524. For an intriguing and suggestive study which finds managers substantially more efficient than mayors see: Bernard H. Booms, "City Governmental Form and Public Expenditure Levels," The National Tax Journal, Vol. XIX, No. 2 (June, 1966), pp. 187-199. The conclusion about relative efficiencies is itself the result of heroic assumptions stemming from the identification problem.

## A RATIONAL THEORY OF THE FEDERAL BUDGETING PROCESS (1)

By

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Otto Davis, M.A.H. Dempster, and Aaron Wildavsky (henceforth referred to as DDW) have recently argued that federal budgeting for non-defense expenditures can be represented as a set of temporally stable linear decision rules and present empirical results in support of this position [1] [2]. Although we have some reservations over certain interpretations that they place upon their results, (2) their claim that the process can be approximated by a set of linear decision rules displaying temporal stability appears to be correct -- at least roughly -- and we are very much in their debt for developing these valuable statistical results. Their commendable courage as incrementalists also deserves our plaudits. Finding the welfare literature on budgeting hopelessly removed from reality, (3) they resolutely refuse to honor it with even a passing nod. They adopt instead a much more process oriented view of budgeting (derived mainly from Wildavsky's detailed observations of federal budgeting [1]), which for the most part can be characterized as incrementalism. Their decision to undertake a systematic empirical study of the budgeting process while simultaneously adopting a wholly fresh approach to their subject surely marks this work as one of the important developments in the budgeting literature.

Stimulating as we find this treatment, we remain unconvinced of the adequacy of the theoretical foundations upon which their analysis is based. First the motivational assumptions appear to be incomplete. Second, and perhaps due to the incompleteness of their behavioral assumptions, the models they examine provide explanation for the conditions observed only in a very limited sense. Third, and as they freely concede, the models are without predictive power.

Our purpose here is to attempt a partial remedy for these conditions by proposing a "rational" theory of the politics of expenditures that is capable of generating the behavior observed. The basic

model is developed in Section I. The parallels between the resulting "markup" budgeting rule and the markup pricing literature are indicated. This permits us to both sharpen the issues and place them in perspective. An interpretation of the results is provided in Section II. Some implications are discussed in Section III, and a digression on the relevance of incrementalism appears in Section IV. The conclusions follow in Section V.

### I. A Critique of DDW and an Alternative Model

DDW find in incrementalism the fundamental explanation for the budgeting behavior observed [1, p. 2]:

Participants in budgeting deal with their overwhelming burdens by adopting aids to calculation. By far the most important aid to calculation is the incremental method. Budgets are almost never actively reviewed as a whole in the sense of considering at once the value of all existing programs as compared to all possible alternatives. Instead, this year's budget is based on last year's budget, with special attention given to a narrow range of increases or decreases.

As a result they examine a class of decision rules of the following type:

$$(1) \quad X_{it} = BX_{it-1} + \epsilon_{it}$$

where  $X_{it}$  = budget request (appropriation) for expenditure class  $i$  in period  $t$ .

$X_{it-1}$  = budget request (appropriation) for expenditure class  $i$  in period  $t-1$  (the base period).

$\epsilon_{it}$  = a random variable with  $E(\epsilon_{it}) = 0$ .

$B$  = a constant which, when multiplied by the base period ( $t-1$ ) budget, yields the expected value of the budget in the subsequent period ( $t$ ). Thus  $B-1$  is the "markup".

Although they consider several variants of this model, the relation given by (1) is the basic equation and appears to be most consistent with their notions of incrementalism. It is important to note, however,

that while incrementalism tells us that the value of B will be close to unity (a proposition that is also consistent with a number of other budgeting theories, including the naive model that  $X_{it} = X_{it-1}$ ), it is difficult to reconcile with either systematic differences in the value of B between agencies or shifts in the value of B over time. That is, the simplest incrementalist budgeting rule would be one which assigned a particular value (e.g., 1.05) to B, which value would then be common to all agencies and invariant over time. DDW ignore these implications of incrementalism. Indeed they appear to find no contradiction between their motivational assumptions and the fact that the best fits are obtained from a model of the form:

$$(1') \quad X_{it} = B_i(T_j) X_{it-1} + \epsilon'_{it}$$

where  $B_i(T_j)$  = value of the constant term for expenditure class  $i$  in political epoch  $T_j$ .

Thus the constant term is permitted to differ between expenditure classes and vary according to political circumstance under this formulation.

The empirical results reported by DDW support this second version of the model. Thus they find that the  $B_i$  do differ between agencies and that shifts in the value of  $B_i$  do occur over time in response to changes in political circumstances. Yet they make no effort to explain the variation of  $B_i$  between agencies and handle the shift in political epochs in a purely ad hoc fashion. Admitting that the  $B_i$  vary between agencies, however, immediately raises the question: What factors are responsible for the variation in  $B_i$ ? "Incrementalism" is not obviously a satisfactory response to questions of this kind. Similarly, to treat shifts in the value of  $B_i$  over time in an ad hoc manner substantially voids the model of predictive power. Rather than attempt to patch up the incrementalist position so as to remedy these shortcomings, we attempt instead to supply a more fundamental rationality basis to the problem.

Before proposing our alternative hypothesis, it might be useful to point out the striking similarity between the budgetary behavior which DDW report and the markup pricing phenomenon. Markup pricing involves setting price as a constant multiple of average cost, namely:

$$(2) \quad P_i = b(AC_i)$$

$P_i$  = price of commodity  $i$

$AC_1$  = average cost of commodity  $i$

$b$  = markup multiplier.

The relation between a rule of this sort and the budgetary rule described above is immediately obvious.

As already indicated, a modification in the simple markup budgeting rule is necessary to accommodate observed variation in the budgetary markup multiplier between expenditure classes and over time. It has similarly been necessary to distinguish between commodity classes in specifying the markup pricing rule and allow for variation in the rule in response to environmental change. The "corrected" rule takes the form:

$$(2') \quad P_i = b_i(AC_i).$$

where  $b_i = b(E_i)$  differs between commodity classes in accordance with the value of  $E_i$ , ( $\partial b_i / \partial E_i < 0$ ).

$E_i$  = elasticity of demand for commodity  $i$ .

It can be shown that in this form, and assuming that average costs are equal to marginal costs in the relevant range, the markup pricing rule is equivalent to profit maximizing behavior. (4) Thus a simple decision rule which on first inspection appears to be rational only in the limited sense that it reduces "overwhelming burdens by adopting aids to calculation" [1, p. 2] can, in its slightly more refined form, be seen to be consistent with rationality of a more comprehensive variety. Our purpose now is to develop the higher level counterpart for the markup budgeting rule and to examine how recasting it as a higher level rationality process improves our understanding of budgetary behavior.

For this purpose, let  $V_{it} = V_{it}(X_{it})$  be the political value of expenditures of type  $i$  in period  $t$ , where  $X_{it}$  is the amount expended. Assume that the budget is allocated between expenditures so as to maximize the President's expected gain and that the total budget to be allocated to non-defense spending is  $\bar{M}_t$ . Several things should be noted about this formulation. First, the political value of expenditures of type  $j$  are assumed to be independent of those of type  $k$  ( $j \neq k$ ). Obviously the level of aggregation at which the analysis of appropriations is conducted will affect the accuracy of this assumption. Furthermore, true independence is not necessary. All that we require is that the President view these expenditures "as if"

their political productivities were independent. (5) Second, the role of Congress in the budgetary process is thoroughly suppressed. We relax this assumption somewhat in Section III. Third, the assumption of maximizing expected political gain is very much in the spirit of Downs' theory of democracy [4]. His substantial success in that undertaking is in no small measure attributable to the prominence which rationality postulates occupy throughout.

Expressing the problem of maximizing political gain as a Lagrangian, we have:

$$(3) \quad \max L(X_{1t}, X_{2t}, \dots, X_{Nt}, \lambda_t) = \sum_i V_{it} - \lambda_t (\sum_i X_{it} - \bar{M}_t) \text{ and}$$

the corresponding first order conditions for a maximum are:

$$(4) \quad \frac{\partial V_{it}}{\partial X_{it}} = \lambda_t, \text{ all nonzero expenditures.}$$

The implicit marginal political cost ( $MPC_t$ ) of expenditures is given by  $\lambda_t$ ; and if this is the same between any two periods  $t$  and  $t-n$ , we have:

$$(5) \quad \frac{\partial V_{it}}{\partial X_{it}} = \frac{\partial V_{it-n}}{\partial X_{it-n}}$$

If now in the neighborhood of  $\lambda_t$ , the marginal political value relations shift by an amount  $\beta_i - 1$  per period, the "markup" phenomenon reported by DDW will result. Suppose, for example, that the  $MPV_i$  relations are given by:

$$(6) \quad \begin{cases} \frac{\partial V_{it}}{\partial X_{it}} = \alpha_{1i} + \alpha_{2i} X_{it}^{\beta_i} \\ \frac{\partial V_{it-n}}{\partial X_{it-n}} = \alpha_{1i} + \alpha_{2i} X_{it-n}^{\beta_i} \end{cases}$$

where  $\alpha_{1i}$ ,  $\alpha_{2i}$ , and  $\beta_i$  are constants and  $\alpha_{2i} \beta_i < 0$ . Empirically the relation

$$(7) \quad X_{it} = B_i^n X_{it-n}$$

is observed to hold. What is the implied value for the shift parameter  $\beta_{it}$ ? Substituting (7) into (6) and equating through (5), we have:

$$\begin{aligned}
 (8) \quad \alpha_{2i} X_{it-n}^{\beta} &= v_{it} [\alpha_{2i} (B_1^n X_{it-n})^{\beta}] \\
 &= v_{it} (B_1^n)^{\beta} (\alpha_{2i} X_{it-n}^{\beta})
 \end{aligned}$$

so that  $v_{it}$  is given by

$$(9) \quad v_{it} = \frac{1}{(B_1^n)^{\beta}}, \text{ where } \hat{B}_1 = B_1^{\beta}.$$

Thus, if annually the  $MPV_i$  relations shift by  $(1/\hat{B}_1)$ , and if the implicit  $MPC_t$  values are substantially identical, the optimal value of expenditures in year  $t$  will be  $B_1$  times those in the immediately preceding year and  $B_1^n$  times those of year  $t-n$ . This is precisely the behavior described by DDW. Note however that whereas they regard behavior of this sort as evidence of the prevalence of incrementalist decision rules throughout complex organizations (but nevertheless fail to account adequately for variation in  $B_1$  either between agencies or inter-temporally), we show conditions under which the rules would evolve from a full-blown maximizing analysis.

Geometrically the relations that we are describing are those shown in Figure 1.

## II. Interpretation of the Results

As input into our model we use the condition that  $X_{it} = B_1^n X_{it-n}$  and see what this implies about the marginal political value of expenditure ( $MPV_i$ ) and marginal political cost ( $MPC_t$ ) relations. Thus we take an observed regularity and a rationality hypothesis and ask what additional specifications are necessary for the rational model to generate the behavior observed. The emphasis here is on empirical regularity and rationality, and the paradigm is: given an empirical regularity, find a rational model that will produce it.

Restricting the search to rational models is deliberate. Behavior that displays such properties will tend to have survival value, while that which does not will tend to be displaced. The qualifier "tend to" is essential in making statements of this sort, perhaps especially in a political as contrasted with a business environment. Insularity of any sort (monopoly, autocracy) can impede the selection process, and the dynamics of adjustment to uncertainty can do likewise [12]. Where insularity is weak or absent, however, failure to act rationally (efficiently) will normally reveal that resources are not being utilized

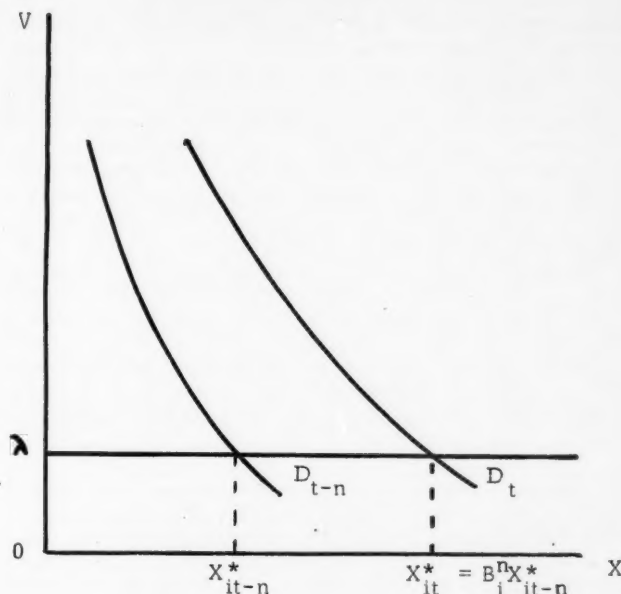


Figure 1

to maximum advantage, and an implicit invitation to rivals to overturn the incumbent exists. We therefore adopt the position of Downs that "in the long run, we naturally expect a rational man to outperform an irrational man, *ceteris paribus*, because random factors cancel and efficiency triumphs over inefficiency" [4, p. 6]. Hence our preference for rational models.

But of course limiting the search to rational models scarcely guarantees uniqueness. Any number of models having rationality properties could be generated which would yield the regularity in question. Selecting between them is, as Friedman has pointed out, a matter of simplicity and fruitfulness [5, p. 10]. On the matter of simplicity, we believe that our version is probably simpler than most of the alternatives. The fruitfulness issue will be deferred for Section III.

Consider now the  $MPV_1$  relations shown in Figure 1. The most direct interpretation of these is that they represent derived demand

curves for services of type  $i$  and that demand is shifting to the right at the rate of  $(B_i - 1)$  per period. Obviously if the clientele group deriving benefits of type  $i$  is growing slower than the population generally, a lower than average value of  $B_i$  would be expected whereas if it is growing faster, a higher than average value of  $B_i$  would ordinarily result. Clearly, however, census population is too simple a basis for projecting demands for services. "Political" population is the relevant group. Thus, although for sectors which are relatively well represented politically the political population may be strictly proportional to if not identical with its corresponding census population, for developing sectors (e.g., the Negro vote) this may be quite untrue. To understand budget appropriations where the population affected is of the latter type, the rate of growth of demand must be measured in political not merely census terms. In either case, however, it seems plausible to assume that clientele demands will tend to increase at a reasonably uniform rate in the short run -- the particular rate depending on the character of the population in question.

With respect to the  $MPC_t$  relations, the condition of constancy implies that there is some relatively unchanging marginal cost of extracting budget money from the economy and that defense and non-defense expenditures are both adjusted until the  $MPV_{it}$  are brought into equality with the prevailing  $MPC_t$ . The assumption that  $MPC_t$  is relatively constant over time so long as the budget and economy grow at roughly the same rate seems plausible. (6) In response to shocks, of course, we would expect occasional shifts. Some of these are considered in Section III.

The (temporally) constant marginal cost assumption is probably more credible than the assumption that demand curves should take the form and shift at the regular rate which we impute to them. Actually, however, the demand functions are, for our purposes, overspecified. All that we really require is that they shift by an amount  $B_i$  per period in the neighborhood of  $\lambda_t$ . Changes in the functions which preserve this property would generate the same budgetary behavior.

The "gaming" attributes reported by DDW constitute an aspect of their studies which our analysis is insufficiently rich to treat. Mainly they find that participants in the budgeting process adopt simple strategies of the form given by (1'). But for some budget classifications they believe that the evidence points to a more elaborate gaming relationship between the agencies and the Congressional appropriations committees. This is surely an interesting aspect of their work and is consistent with Wildavsky's earlier

observations of the budgeting process [11, Chap. 3]. It nevertheless presents difficult statistical problems of discriminating between alternative hypotheses, a problem which, hopefully, they will deal with more exhaustively in a later paper. In the meantime we should like to conjecture the following hypothesis: so long as an agency conscientiously adopts an acceptable role as expected of it by Congress, "gaming" is of no account. In other words, the agency can employ any "strategy" as long as it is a congressionally approved one and the outcome will be unaffected. Role playing is, however, important, and for an agency to step out of character can give rise to painful short-term consequences [11, pp. 160-165]. Thus the critical consideration is for the agency to select from within the subset of acceptable strategies, which we interpret to mean that it adopt the role of an advocate and behave "predictably." Advocacy is necessary for the appropriations committees to discover the ramifications of proposed expenditures and predictability provides the desired relational stability. Subject to these constraints, any one strategy will produce for an agency essentially the same appropriation as any other. This would appear to correspond with the results from Cyert and March's experimental studies of payoff biases, from which they concluded that "most biases are recognized by other parts of the organization . . . . Once detected, the bias is vitiated by a correction factor" [3, p. 82]. Thus, subject to a stability constraint, biases are effectively compensated; gaming, as we are suggesting, leaves the outcome unaffected.

If these conjectures are correct, the need for detailed examinations of agency-congressional relationships is weakened while the case for employing a more detached approach of the type developed in this paper becomes stronger. If instead the position outlined above is substantially incorrect, the approach used here will fall short of the mark and studies in depth of the agency-congressional relationships will be required.

### III. Some Implications

Although DDW report that the markup ratio tends to be constant over the short run, occasional shifts from one growth rate to another are also detected. They note that many of these occur in the early years of the Eisenhower administration [2, pp. 85-86]. Naturally enough they consider these shifts to be due to a systematic change in policy, but there being no provision for such a shift under an incrementalist view of budgeting, their explanations are somewhat unsatisfactory. The "rational" view of this matter, however, is that the political

productivity of some classes of expenditures differs with political administrations, since the relative importance of clientele groups and their susceptibility to influence changes. Thus higher values of  $B_i$  are to be expected for those types of expenditures for which the President owes political obligations, has made prior commitments, or views opportunistically as circumstances in which advantage can be secured. Rationality therefore calls for changing the decision rule in response to shifts in the demand for expenditures functions. Indeed, failure for some such changes to occur would be evidence of either an unusual degree of consensus between administrations or impotency in the office of the Presidency. Casual empiricism suggests that nontrivial commitments with respect to certain classes of expenditures do exist between parties and that the Presidency is a powerful office. The virtues of incrementalism notwithstanding, a shift in certain decision rules as administrations change therefore seems likely. Once, however, the system has been brought into adjustment, decision rule stability due to the reasons given above would once again be expected. DDW's empirical evidence apparently supports the argument that the system restabilizes after displacements of this sort.

Not all shifts need result from political differences in the demand for expenditures functions, however. Some may result from objective changes in the composition of the franchise. Thus the age distribution may change, or previously disinterested or underrepresented sectors may become politically more active. In either case, our theory would predict an upward shift in the level of expenditures for those types of services that these now relatively more powerful groups generate. This is generally consistent with Peacock and Wiseman's observation regarding the provision of social services in Great Britain: "From at least the time of the election of the Liberal Government of 1906, there was growing agreement about the desirability of increased public expenditure, particularly for purposes of social welfare. At the same time, the extension of the franchise began to increase the political power of those with most to gain from increased spending on social services" [10, p. xxvii]. Although virtually any rational theory which views expenditures as a means of securing votes would lead to this type of prediction, it is noteworthy that the incrementalist approach to budgeting is altogether silent on this issue. Indeed, except as it implies gradualist rather than instantaneous adjustment, which is a distinct merit in our opinion, the incrementalist theory is silent quite generally. (7)

As evident from the above, the demand functions, and particularly differences between them, either cross sectionally or intertemporally, are a principal source of implications for the rational model --

including the important if easily overlooked proposition that expenditure classes for which clientele growth is variable will, if estimated by an equation of the form of (1'), provide a poor fit. But the marginal political cost function can be made to produce important insights as well. In particular, shifts in the cost function bear a close relation to what Peacock and Wiseman have termed the "displacement effect" 10, pp. [26-27]:

When societies are not being subjected to unusually violent pressures or disturbances, people's ideas about the "tolerable" burden of government taxation tend to be fairly stable. Governments may of course have plans that would increase their expenditures, and the plans may be thought desirable by many of the citizens. Nevertheless, their implementation, and thus the rate of growth of government expenditure, will depend upon the view taken by the government as to revenues that it is politically able to raise as well as upon its own views as to the desirability of increasing government expenditures in any direction. Consequently government expenditure may rise in such periods, but it will do so at a steady and relatively unspectacular rate ....

This condition can be upset ... by social disturbances that destroy established conceptions and produce a displacement effect. People will accept, in a period of crisis, tax levels they would have thought intolerable, and this acceptance remains when the disturbance itself has disappeared. As a result, the revenue and expenditure statistics of the government show a displacement after periods of social disturbance. Expenditures may fall when the disturbance is over, but they are less likely to return to the old level.

Interpreting this behavior in the context of our model, we would argue that the effect of a social crisis, perhaps especially one concerned with defense, is to raise the tolerance threshold to taxes. When the crisis abates, the voters, having adjusted to the new high level of taxation, do not demand a return to what previously had been the politically feasible levels. The acceptable level increases. In the event of a protracted defense spending crisis, for example, we would expect that non-defense spending would be affected in the following way. Initially the defense sector will pre-empt funds from the non-defense sector and thus raise the implicit cost of budget money for non-defense purposes. Consequently non-defense appropriations may initially have to be restricted. As new sources of revenue are developed, however, this pressure on the non-defense sector will ease, and when the pre-emptive supernormal demands of the defense sector abate, a large increase over the previous trend value for  $M_t$  will occur. This will produce a sharp decline in the

implicit marginal political cost of budget money, and thus expenditures for non-defense purposes will be displaced upward from their previous trend values. No shifts in the demand for expenditure functions from their previous moving equilibrium values are required (although this is not to say they will not occur). The entire adjustment process can result from simple changes in the implicit cost of budget money.

Finally we might indicate briefly how the model can be extended to make allowance, at least indirectly, for congressional influences. We assume for this purpose that if the President's proposals run counter to congressional preferences that he must draw on his political capital to get his programs approved. When his stock of capital is low he must ration it among congressionally unpopular programs, whereas when his capital stock is high he can expend it freely. Letting  $\bar{K}_t$  be the President's stock of political capital in period  $t$  and  $g_{it}(X_{it})$  be congressional resistance to expenditures of type  $i$  in period  $t$ , our problem can be reformulated as:

$$(11) \quad \max \sum_i V_{it}$$

$$\text{s.t. (i) } \sum_i X_{it} = \bar{M}_t$$

$$(ii) \sum_i g_{it}(X_{it}) \leq \bar{K}_t, \quad \frac{\partial g_{it}}{\partial X_{it}} \geq 0$$

and expressing this as a Lagrangian, we have:

$$(12) \quad \max L(X_{1t}, X_{2t}, \dots, X_{Nt}, \lambda_t, \mu_t) =$$

$$\sum_i V_{it} - \lambda_t (\sum_i X_{it} - \bar{M}_t)$$

$$- \mu_t (\sum_i g_{it}(X_{it}) - \bar{K}_t)$$

and first order conditions for a maximum are:

$$(13) \quad \frac{\partial V_{it}}{\partial X_{it}} = \lambda_t + \mu_t \cdot \frac{\partial g_{it}}{\partial X_{it}}, \quad \text{all nonzero expenditures.}$$

Now if the President's political capital is very high and the second

constraint is not binding,  $\mu_t$  will be equal to zero (8) and (13) becomes identical with (4). If instead his political capital is low and the second constraint is binding so that  $\mu_t > 0$ , the second term will vanish only for those expenditures for which  $\frac{\partial g_{it}}{\partial x_{it}} = 0$ . This latter

condition will prevail only for that subset of expenditures for which congressional resistance is nil. For  $\bar{M}_t$  unchanged, therefore, a reduction in  $\bar{K}_t$  sufficient to activate the second constraint will give rise to a reshuffling of expenditures in favor of those which meet little or no congressional resistance and away from those which do.

The question naturally arises as to what determines the value of  $\bar{K}_t$ . Partly this is a function of the President's personality -- e.g. his disposition to be assertive -- and partly it is a function of his "popularity" or position with the public. Some of these influences can be detected in Neustadt's treatment of Presidential Power. Thus he observes [7, p. 91]:

With "powers" and with status -- and sufficient show of will -- a President of the United States can wield effective influence in many situations even though he has a balky Congress and seems short on popular appeal. Obviously though, the less his demonstrated power at the Capitol, the more he is confined, downtown, to realms where sheer command proves workable. The weaker his apparent popular support, the more his course in Congress may depend on negatives at his disposal like the veto, or "impounding". He may not be left helpless, but his options are reduced, his opportunities diminished, his freedom for maneuver checked in the degree that Washington conceives him unimpressive to the public.

The importance of assertiveness is perhaps best indicated by the transformation which Eisenhower managed in 1959. "Impressions of equivocation were replaced by visions of tenacity and not a little skill. In his seventh year this President apparently won more respect from Washington on both these scores than he had been accorded since the time of his belated honeymoon in 1955, after the eclipse of Senator McCarthy and before the Denver heart attack" [7, p. 85].

Related to but not identical with the President's assertiveness is the skill with which he utilizes his capital stock [7, pp. 53, 174]. This matter of expertise can be treated as a problem of efficiency. Whereas total political capital stock is  $\bar{K}_t$ , effective political capital stock is  $\eta \bar{K}_t$ , where  $\eta (0 < \eta < 1)$  is a "coefficient of effectiveness."

It is an index of the President's skills as a politician among politicians.

Further refinements in the model beyond those indicated here might also be useful. At best we would claim to have the rudiments of a rational model. We suspect, however, that supply and demand analysis (expressed in terms of marginal political cost and marginal political productivity) will provide the core for such extensions. The complaint that such "marginal" relations are not easily quantified misses the point: qualitative or quasi-quantitative predictions obviously derive from the model without a full specification of the underlying parts. If eventually it proves necessary to allow for gaming responses between the President, the agencies, and Congress, a more subtle variety of rationality than that used in the direct approach taken here will be required. But until the evidence on this becomes more compelling, we are inclined to stand by our position on gaming expressed above.

#### IV. A Digression on Incrementalism

Lest we leave the impression that incrementalism has no place in the study of complex systems, we take this opportunity to put our remarks in perspective. If information were free and could be processed costlessly, and if organizational change did not involve transition costs, optimality would require that marginal political productivities and marginal political costs be continuously equated. But if these conditions of costlessness do not hold, we should expect instead that approximating devices and gradualist procedures would characterize the adjustment process. This is the sense in which incrementalism seems to us useful. Thus it is not a theory of equilibrium levels of expenditure, nor does it yield comparative static results. Rather, it is a device by which to deal with complexity in circumstances where equilibrium has been approximately established.

In what respects then does our "rational" theory of markup budgeting need to be amended? We would preserve the basic theory but extend it to include a threshold response mechanism. Thus suppose that it is prohibitively costly to detect a budget error of less than  $z$  percent or an absolute error of less than  $\bar{Z}$ . Assume that for a particular expenditure class that the percentage error becomes binding before the absolute error is effective (i.e.,  $\bar{Z} > z\bar{X}$ , where  $\bar{X}$  is the amount budgeted), and suppose that  $z$  is 10 per cent. If then the true average rate of growth of clientele demands is 7

per cent per period, a budgeted rate of increase of expenditures as high as 9 per cent or as low as 5 per cent could prevail for as long as 4 years before the cumulative error would exceed the 10 per cent threshold level and the appropriate budget correction made. Even then, because of transition costs, a gradual rather than an instantaneous adjustment would be expected.

Although this example is crude, it can easily be refined to include such important differences between expenditure classes as the elasticity of the marginal political value relations (*ceteris paribus*, the more elastic the demand for expenditures the greater the tolerable error). Such refinements would not, however, alter the basic argument, to wit: the rational model continues to explain the major variations in both the level and growth rate of expenditures between expenditure classes while information costs are responsible for temporal constancy in the decision rules and possible errors in estimating true demand conditions. This latter is an important qualification, and incrementalism can not therefore be dismissed, but the core of the model developed above remains unchanged.

## V. Conclusions

If we have learned anything at all from the discussion of markup pricing it is that viable rules of thumb are generally not mere whimsy or accident but have indeed a rationality basis themselves. DDW, however, appear to be inviting us to cover this ground again without in any significant sense benefiting from the history of the markup pricing debates. But clearly the parallels between markup pricing and markup budgeting are striking. In the former case it is necessary to distinguish between commodity classes and to adjust to changes in the elasticity of demand over time if the markup rules are truly to be optimal. In the latter it is similarly necessary to distinguish between expenditure classes and to detect changes in political demands over time. Moreover, while markup pricing depends on a specialization of the cost function to be fully appropriate, namely that  $MC_i = AC_i$  in the relevant range, markup budgeting also depends on the assumption that the marginal political cost of funds is roughly constant over the short run and on a specialization of the moving equilibrium properties of the marginal political value curve, namely that it be homogeneous of degree  $\beta_i$  in  $X_{it}$  and that it shift at the rate of  $1/\beta_i$  per period. Markup pricing based on demand elasticities is entirely rational if the assumptions regarding the MC curve hold approximately. Similarly markup budgeting is rational if  $MPC_t$  is temporally constant and if the  $MPV_i$  curve experiences a progressive

shift of the type indicated. Thus, although the parallels are not perfect, they are sufficiently close and numerous to suggest that what took us so long to learn about the markup pricing phenomenon can usefully be applied to an understanding of markup budgeting. Indeed, we believe that Papandreou's remarks concerning markup pricing are applicable to markup budgeting as well [8, p. 395]:

... the advocates of the nonrational approach ... must be in a position ... to predict which rule of thumb will be employed in what firms [agencies] at what time and place. The attempt to do so, I am convinced, will make it necessary for them to fall back upon a rational-action model.

Although there are reasons for believing that the rationality hypothesis may be more appropriate for studying the pricing behavior of business firms than the budgeting behavior of governments, we believe these distinctions can easily be overdrawn. Much of the resistance to a rationality approach to government budgeting stems from its use in normative theories for maximizing welfare. As Downs [3] and others have observed, democracies are simply not the vehicle for achieving such welfare objectives. But this does not mean the rationality models are irrelevant to a study of budgeting. Rationality provides a powerful organizing device for positive theories that are concerned with what is rather than an abstract welfare ideal. This is precisely the way in which rationality is used here: the President is treated as a vote maximizer subject to constraint.

A "richer" theory of Presidential behavior that is still within the family of rational models would treat him as a utility maximizer, in which the principal components of his utility function included a concern for his image as a great man as well as a vote-getter. Although frequently these may be complementary objectives, occasionally they may come into conflict. Whereas the present theory fails to make such distinctions or resolves all such differences in favor of votes, a more general theory would allow for tradeoffs. These might be especially important in the President's second term.

Our immediate purpose has been to show how a rational model of the budgeting process yields greater explanatory and predictive power than the incrementalist model provided. Our more general objective is to show wherein the application of the economists' tools for studying rational behavior can be used to structure difficult political science problems which have hitherto evaded formal analysis. The empirical results reported by DDW seemed to us to be begging for a theory that goes beyond the inherent limitations of "incrementalism." Our attempt at providing a rationality basis for this behavior

is surely only a first step in this direction. But if we have succeeded at all, it will be in demonstrating the power of the rationality model not merely for the budgeting process but as a potential technique for investigating a wide range of political science issues.

## NOTES

1. Research on this paper was supported by a grant to the author from the National Science Foundation. Interest in the subject was stimulated by a conference on "Non-Market Decision Making" sponsored by the Social Science Research Council in April, 1966. The author was a discussant of the DDW papers ([1] [2]) at this conference. I should like to acknowledge the helpful comments of James Buchanan, David Conrath, Bruce Malkin, Charles Plott, and Aaron Wildavsky on an earlier draft of this paper. I hasten to add, however, that the usual absolution, both from sins of omission and commission, is not mere convention in this instance. The views expressed are those of the author and are not necessarily shared by the Justice Department.
2. Our principal objection is to the notion that incrementalist assumptions effectively explain the behavior observed. The reasons for this are given below. Fundamentally it is due to the lack of power in the incrementalist hypothesis. It tells us that complex organizations will not be very far tomorrow from where they are today -- which is useful. But more interesting are the questions of where the organization has been, where it is going, and why. On these issues, incrementalism leaves the investigator foundering. Inasmuch as the incrementalist theory is silent on these issues, it is difficult to sustain the DDW conclusion that "Since the fits [to the incrementalist models] presented here appear good ... these models describe the aggregate budgeting process of the United States Government" [2, p. 88].
3. For a review of the welfare approach to budgeting, see Musgrave [6, pp. 110-115].
4. This is derived in a number of places, e.g. Scitovsky [9, pp. 289-290].
5. The assumption of independence implies that the function  $V = V(X_1, X_2, \dots, X_N)$  is additively separable, so that it can be expressed as  $V = V_1(X_1) + V_2(X_2) + \dots + V_N(X_N)$ . If

instead interdependency within but independence between subsets of agency expenditures is assumed to exist, we have  $V = V_I(\bar{X}_I) + V_{II}(\bar{X}_{II}) = \dots + V_M(\bar{X}_M)$ , where  $\bar{X}_j$  is a vector of agency expenditures in subset  $j$ . Our formulation is obviously an extreme version of such separability. Efforts to establish the limits on additive separability would seem to us a useful direction in which to move in the study of budget behavior, but such is beyond the scope of this paper.

6. For expenditures to grow as indicated, it is necessary for the budget to increase according to the relation  $\bar{M}_t = \sum_i B_i X_{it-n}$ , but unfortunately this does not imply any simple relation between  $\bar{M}_t$  and  $\bar{M}_{t-n}$ . Restricting our attentions to the short run, however, and assuming that the values of  $B_i$  are not significantly different among principal expenditure classes, steady growth in  $\bar{M}_t$  would be approximately consistent with the above relation.
7. The DDW paper is one of the few studies to employ incrementalism in a systematic way to deal with a class of data which is not experimentally generated and has policy importance. Their bold attempt to use it to study budgeting behavior is therefore novel in this aspect. Whether incrementalism is inherently weak as a predictive device except as it deals specifically with the decision process is unclear. Additional studies which employ an incrementalist framework will be needed before this judgement can be made.
8. By the Kuhn-Tucker Theorem.

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1. In

A NOTE ON SUPPLEMENTAL APPROPRIATIONS  
IN THE FEDERAL BUDGETARY PROCESS (1)

By

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1. Introduction:

The sources of funds for the agencies of the United States Government are two distinct types of appropriations. The regular appropriations associated with the annual budget are the largest source. Other appropriations, which are usually made during the current fiscal year, are called supplementals. In two recent papers [1, 2] Davis, Dempster and Wildavsky studied the process by which regular appropriations are allocated to over one half of the non-defense agencies of the Federal Government. The research reported here concerns supplemental appropriations.

The second section briefly summarizes the relevant aspects of the Davis-Dempster-Wildavsky papers. Section 3 presents several alternative behavioral models, which are based upon micro considerations, of the process of making supplemental appropriations. The empirical tests and results for these models are reported in section 4. Two additional models which reflect macro considerations, along with an indication of the empirical results, are discussed in section 5. A final section reports conclusions.

2. Relevant Aspects of the Davis-Dempster-Wildavsky Papers:

In Davis, Dempster and Wildavsky [1, 2] it is reported that one of three simple linear equations describes the relation between the regular appropriation requested by the Bureau of the Budget for any particular agency and the final Congressional appropriation for that agency. (2) Let  $y_t$  represent the actual regular appropriation for some given agency in the  $t^{\text{th}}$  year and let  $x_t$  represent the requested appropriation for the same agency for the  $t^{\text{th}}$  year. Then the

alternative behavioral equations are

$$(2.1) \quad y_t = a_0 x_t + \eta_t$$

$$(2.2) \quad y_t = a_1 x_t + a_2 v_{t-1} + \epsilon_t$$

$$(2.3) \quad y_t = a_3 x_t + a_4 \lambda_t + \delta_t$$

where the  $a$ 's are coefficients to be estimated;  $\eta_t$ ,  $\epsilon_t$ , and  $\delta_t$  are stochastic disturbances which are assumed to be serially independent with finite variance and zero expectation;  $v_{t-1}$  is a stochastic component generated according to the first order Markov scheme

$$(2.4) \quad v_t = a_2 v_{t-1} + \epsilon_t$$

and  $\lambda_t$  is a dummy variable representing that portion of the agency's request  $x_t$  which is not based upon the previous appropriation  $y_{t-1}$ . For some given agency, the selection of the particular equation best representing Congressional behavior is based upon certain criteria which are applied to empirical estimations from existing data.

One criticism of the Davis-Dempster-Wildavsky papers [1, 2] is that supplemental appropriations, which might be an integral part of the allocative process, are not considered. One of the purposes of this study is to determine whether such a criticism is valid. It will be seen that some of the models reported below are related to those of the Davis-Dempster-Wildavsky papers so that an assessment of this criticism is made possible.

### 3. Micro Models for the Granting of Supplemental Appropriations:

Four basic conditions, all involving micro considerations, are distinguished. Each of these conditions implies an alternate model. The conditions and the associated models are discussed below.

Imagine first that the Congress usually anticipates giving some specified agency a part of its annual appropriation in the form of a supplemental. In this instance, supplemental appropriations are given to the specified agency nearly every year. Since it is obvious that some agencies satisfy this condition, one may add richness to the model by postulating that, at least up to a random error, the Congress tends to grant relatively large supplementals when it has given the agency a smaller regular appropriation than might be expected on the basis of its past behavior. Correspondingly, Congress might tend to give relatively small supplementals when it has granted

the agency a larger appropriation than past behavior would lead one to expect. In order to formalize this hypothesis, consider the following definitions.

- $s_{it}$ : The supplemental appropriation for the  $i^{\text{th}}$  agency in year  $t$ .
- $m_{it}$ : The estimated residual for the  $t^{\text{th}}$  year for the one of (2.1, 2.2, or 2.3) selected in the Davis-Dempster-Wildavsky study to best represent Congressional behavior in granting regular appropriations to the  $i^{\text{th}}$  agency.

The above hypothesis implies a negative correlation between  $s_{it}$ , the supplemental appropriation, and  $m_{it}$ , the estimated residual. The behavioral equation for this model is

$$(3.1) \quad s_{it} = \beta_{i0} + \beta_{i1}m_{it} + e_{it}$$

where  $\beta_{i0}$  is a constant,  $\beta_{i1}$  is an unknown coefficient, and  $e_{it}$  is a stochastic disturbance which is assumed serially independent with a finite variance and zero expectation. Note that in this formulation the constant  $\beta_{i0}$  represents the "usual" or the "expected" supplemental appropriation for the  $i^{\text{th}}$  agency if there is no trend. Also observe that  $\beta_{i1} < 0$  is anticipated. Finally, observe that this model can be slightly refined by removing any time trend (if there is one) from the supplemental appropriations since the interest here is in explaining deviations from "expected" supplementals whether or not this value rises or falls over time. For reasons made clear in section 4, this modification was not accomplished.

The second situation applies to an agency which receives a supplemental appropriation only after it has suffered a large cut in what otherwise might be expected to be its regular appropriation. This condition could be expected to occur only infrequently, probably less than two years out of three. Further, there should be a negative correlation between supplementals and the residuals of the appropriate equation from (2.1, 2.2, or 2.3) above which relate regular appropriations to agency requests. Consider the following definition.

- $R_{it}$ : The value of the estimated residual in the  $t^{\text{th}}$  year for the equation selected from (2.1, 2.2, or 2.3) to be the one best representing Congressional behavior in granting regular appropriations to the  $i^{\text{th}}$  agency if that residual

is less than or equal to  $K$  (a constant) and zero otherwise.

One expects  $R_{it}$  to be negatively correlated with the supplemental appropriations  $s_{it}$ . The behavioral equation for this model is

$$(3.2) \quad s_{it} = \beta_{12} + \beta_{13} R_{it} + \phi_{it}$$

where  $\beta_{12}$  is an unknown constant,  $\beta_{13}$  represents the unknown coefficient, and  $\phi_{it}$  is a stochastic disturbance. Note that  $\beta_{13} < 0$  is expected. Observe that one might interpret this model as Congress correcting its own behavior by granting supplemental appropriation.

The third condition or situation applies when an agency has planned so badly that it runs out of funds necessary for the operation of its on-going programs. Consequently, if these programs are not to come to a halt, the agency has to request and the Congress has to grant a supplemental appropriation. In the following year one can expect that the agency will take this situation into account and "pad" the request for its regular appropriation in order to help insure that it will not again run out of funds. On the other hand, one can also expect the Congress to attempt to teach the agency a lesson with the only real weapon at hand by appropriating a sum which represents an unusually large cut in the agency's request. In other words, the agency's appropriation for the following year  $y_{1,t+1}$  should be below the value predicted from the appropriate equation from (2.1, 2.2, or 2.3) above so that the estimated residual for that year  $m_{1,t+1}$  should be larger (negatively) than usual. If this situation is repeated many times, one should observe a negative correlation between supplemental appropriations  $s_{it}$  in the  $t^{\text{th}}$  year and the estimated residuals  $m_{1,t+1}$  for the following year. These notions are formalized in the behavioral equation

$$(3.3) \quad m_{1,t+1} = \beta_{14} + \beta_{15} s_{it} + u_{it}$$

where  $\beta_{14}$  is an unknown constant (possibly zero),  $\beta_{15}$  is an unknown coefficient, and  $u_{it}$  is a stochastic disturbance. Note that  $\beta_{15} < 0$  is anticipated.

The final condition involving micro considerations consists of situations in which supplemental appropriations could be given for a number of reasons. These reasons may be eminently sensible or rational to anyone with knowledge of the context in which the supplemental appropriations were made. Yet, to an outside observer without such knowledge these appropriations may be viewed as nothing more than a random variable. Two examples may make this

point more clear. Consider an agency such as the Forest Service. One of its activities is fighting forest fires, which certainly are more likely to occur during periods of dry weather. This Agency could either omit a provision for this activity in its annual budget and cover the necessary expenditures with supplemental appropriations, or it could make a provision and only have to make a recourse to supplemental appropriations in exceptionally dry years. In either event, of course, the supplementals would appear to be similar to a random variable to an outside observer without knowledge of the situation. As another example, consider the start of a new program. There is no reason for this new program necessarily to be begun through the regular budgetary process. Supplemental appropriations are often used for such a purpose. Again, to an outside observer such supplementals can be viewed as a random variable. The behavioral equation for this model takes the particularly simple form

$$(3.4) \quad s_{it} = \beta_{i6} + \psi_{it}$$

where  $\beta_{i6}$  is an unknown constant and  $\psi_{it}$  is a stochastic disturbance. Note that in this instance the unknown constant is interpreted as the smallest supplemental appropriation which the agency can be granted so that  $\beta_{i6} = 0$  is usually to be anticipated. Also observe that the restriction  $\psi_{it} \geq 0$  is necessary here since negative supplementals are not allowed.

#### 4. A Summary of the Empirical Results:

It is now necessary to discuss briefly the method for selecting from the alternate models that particular one which seems to best represent Congressional behavior in the granting of supplemental appropriations for some given agency. Note that, aside from the difference in the frequency with which supplementals are given, models (3.1) and (3.2) share similar features. If one ignores for a moment the subtle characteristics of the definition of  $R_{it}$ , both of these models predict a negative correlation between the supplementals  $s_{it}$  and the residuals  $m_{it}$  for the corresponding year. Accordingly, it is appropriate, at least in initial stages of investigation, to treat these models as one and try to determine whether it, (3.3) or (3.4) best represents Congressional behavior.

Now observe that while the combined model (3.1 and 3.2) predicts a negative correlation between the supplementals  $s_{it}$  and the residuals  $m_{it}$  for the corresponding year, model (3.3) anticipates a negative correlation between the supplementals  $s_{it}$  and the residuals  $m_{i,t+1}$  for the following year. Model (3.4) predicts no such correlation.

Accordingly, one might examine the statistics associated with the regression equation

$$(4.1) \quad \varepsilon_{it} = \theta_{17} + \theta_{18} m_{it} + \theta_{19} m_{i,t+1} + \pi_{it}$$

where the  $\theta$ 's represent a constant or the coefficients and  $\pi_{it}$  is a stochastic disturbance. Then if neither of the coefficients ( $\theta_{18}$  or  $\theta_{19}$ ) are significantly different from zero in the desired direction at a prescribed level of confidence, one must presume that (3.4) obtains. Otherwise, the combined model or (3.3) should be selected depending upon which of the coefficients was most significantly different from zero. An alternative procedure is to fit (3.1) and (3.3) separately and to use the same selection criteria with the fit for (3.1) representing the combined model (3.1 and 3.2). Both of these procedures were followed in the empirical work with very similar results in each instance, but for reasons of brevity only the results of the latter method are reported below. (3)

Consider estimating a simple regression on pairs of data obtained by making independent draws from a specified probability distribution. Since the draws are independent, the variables are truly uncorrelated. Yet, if this experiment were conducted repeatedly, one should expect to obtain significance at the 10 percent level 10 percent of the time, significance at the 25 percent level 25 percent of the time, etc. Figure 1 represents the expected results, in terms of the significance of the computed  $t$  statistic of the coefficient, for 80 repetitions of this experiment. The first bar indicates the expected number of computed  $t$  statistics which should be significant at the 100 percent level but not the 90 percent level; the second bar shows the corresponding number significant at the 90 percent level but not the 80 percent level; etc. Each bar contains 10 percent -- i.e., 8 -- of the total number.

Figure 2 is a histogram analogous to Figure 1 except that it reports the actual number of computed  $t$  statistics in each class which resulted from estimating the indicated regression coefficients from the data on supplemental appropriations and the appropriate residuals. Note the similarity of the two figures. A chi square goodness of fit test indicates that the two histograms are not significantly different at the 30 percent level.

It should be pointed out that the histograms were compiled without regard to the signs of the coefficients. In fact, the signs are important. In the empirical results there were 33 negative coefficients and 47 positive ones. Using the normal approximation to the binomial and a null hypothesis that positive and negative

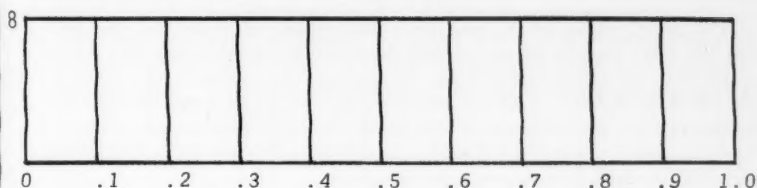


Figure 1

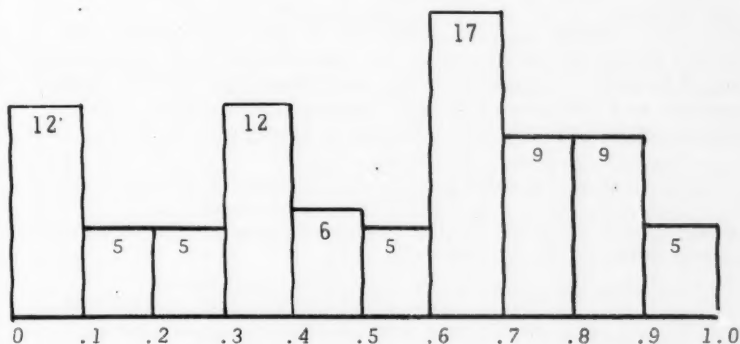


Figure 2

coefficients are equally likely, one cannot reject the null hypothesis at the 10 percent level of significance. In short, the evidence seems to support the notion that supplemental appropriations are not related to the residuals of the equations representing Congressional behavior in the granting of regular appropriations. The evidence indicates that (3.4) is the most appropriate of the models presented in section 3 to represent Congressional behavior in the granting of supplemental appropriations. Model (3.4), on the other hand, merely indicates that the factors affecting supplemental appropriations are statistically independent of those influencing the process through which regular appropriations are made. This result is obtained whether or not an individual agency usually receives an annual supplemental.

### 5. Macro Considerations and the Granting of Supplementals:

The conclusions of the previous section do not imply, of course, that the only factors affecting supplemental appropriations are specific to individual agencies. It may be that over-all, or macro, considerations help to determine the conditions under which these appropriations are granted so that supplementals may be given more freely in some years than others. In order to explore this possibility, two models were formulated and tested.

Suppose first that the Congressional decision-makers desire for the Federal Government to operate at neither a "profit" nor a "loss" so that they desire to see annual receipts equal the total of all appropriations, both regular and supplemental. Of course, when the regular budget is enacted only a projection of governmental receipts is known. Later in the year, better information is available. According to this line of reasoning, the Congressional decision-makers should be willing to grant both more and larger supplemental appropriations in a year when a surplus was anticipated than in a year when a deficit was expected. In order to formalize this notion, define

$$(5.1) \quad S_t = \sum_i s_{it}$$

so that  $S_t$  represents the total of the non-defense supplementals granted in the  $t^{\text{th}}$  year. Also define

$E_t$  : The mid-year (fiscal) estimate of the positive or negative surplus of the budget in year  $t$ .

The model can be written

$$(5.2) \quad S_t = \beta_1 + \beta_2 E_t + \epsilon_t$$

where the  $\beta$ 's have their usual interpretation and  $\epsilon_t$  represents a stochastic disturbance. Note that  $\beta_2 > 0$  is anticipated.

The estimate of the surplus or deficit for the current fiscal year is published along with the President's proposed budget for the following fiscal year. Utilizing these estimates for the 1947-1962 period and the corresponding data on supplemental appropriations, the least squares estimates of the parameters of (5.2) were calculated. The estimate of  $\beta_2$  was negative and not significantly different from zero at the 60 percent level. It was noted that the total supplemental appropriations for several years were greatly influenced by single agencies. In at least one instance this influence was caused by the start of a large new program. In order to mitigate this effect, all

agencies with a supplemental appropriation of over one billion during the period were eliminated and the regression recalculated. The results were again negative and insignificant. This evidence suggests that the consideration of a budgetary surplus or deficit has no influence upon Congressional decision-makers in their determination of supplemental appropriations.

Another possible influence is that of unemployment. One might think that Congressional decision-makers are more willing to grant supplemental appropriations when unemployment is relatively high and increased governmental spending might bolster the economy. Define

$U_t$  : The rate of unemployment as reported in The Historical Statistics of the U. S.

Consider

$$(5.3) \quad S_t = \beta_3 + \beta_4 U_t + \gamma_t$$

where the  $\beta$ 's have their usual interpretation and  $\gamma_t$  represents a stochastic disturbance. Note that if the Congress does consider the rate of unemployment in making supplemental appropriations, then  $\beta_4 > 0$  is implied.

Using the supplemental appropriations for the non-defense agencies, least squares estimates of the parameters of (5.3) were calculated. The estimate of  $\beta_4$  was negative and insignificant at the 30 percent level. The calculations were repeated after the removal of those agencies which had a supplemental appropriation of over one billion during the period. The results were again negative and insignificant. This evidence suggests that unemployment is not a factor in the determination of supplemental appropriations.

## 6. Concluding Comments:

The evidence suggests that the factors affecting supplemental appropriations are statistically independent of those influencing regular appropriations so that supplementals properly may be overlooked in a study of the regular budgetary process. It does not appear that there are factors, or at least easily identifiable ones, which simultaneously affect the level of all supplemental appropriations. Indeed, the determinates of supplementals appear to be so agency-specific that one might have to be able to predict unexpected contingencies if one wished to be able to explain the nature

of the apparent randomness.

## NOTES

1. This research was supported by a grant from Resources for the Future, Inc., to the Graduate School of Industrial Administration, Carnegie Institute of Technology.
2. It might be noted that the budgetary processes in municipal governments appear to be somewhat more complicated in the sense that the over-all budgetary constraint seems to be a central concern. See Crecine's impressive study [3].
3. The data refer to the period 1947-1962 inclusive. For obvious reasons, only those agencies studied by Davis, Dempster and Wildavsky [1] for which records were available were considered.

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- [2] Otto A. Davis, M.A.H. Dempster, and Aaron Wildavsky, "A Theory of the Budgetary Process," American Political Science Review, 60 (September, 1966), pp. 529-47.
- [3] John P. Crecine, A Computer Simulation Model of Municipal Resource Allocation, doctoral dissertation, Graduate School of Industrial Administration, Carnegie Institute of Technology, 1966; forthcoming in an abridged version from Rand McNally.

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## REVIEW

By

Roger Sherman

Insider Trading and the Stock Market, By Henry G. Manne  
New York: The Free Press, 1966, ix, 274, \$6.95

Are large corporations controlled by their owners? Many think the control is tenuous, because owners are disorganized and they seldom manage actively. Laws to enhance owners' control prevent hired managements from acting against the owners' interests. In particular, managers cannot use inside information to trade in company shares for personal gain, on the presumption that owners would be unfairly injured as a result. Professor Manne now challenges that presumption with a contentious brief in defense of trading by insiders.

After a critical review of legal efforts to prevent insider trading (35 case opinions are included in an appendix), the author develops two arguments: (1) insider trading has little effect on stockholders or outsiders, and (2) business firm (but not government) insiders are entitled to any trading gains they can make. His examination of effects on stockholders and outsiders begins by tracing some of the ways insiders can market their information. Outright sale is difficult and rare, but exchange of valuable information through an elaborate insider-investment banker establishment is sketched and claimed to occur. This interesting exchange network distributes rights of access to information (e.g., directorships) as well as information proper. Insider information can lead to changes in value, of course, which can be exploited through stock transactions. The author's discussion of trading rules is marred by his reliance on polar cases, one of which associates all information with insiders and thus imputes virtues to them that could come instead from other sources. Nevertheless, he correctly shows that only a small fraction of stockholders will be harmed by insider trading; only marginal sellers (or buyers) lose the value of information that insiders exploit.

No argument can escape this potential for harm to the marginal

sellers. Whether they are unjustly harmed depends on whether the insider is considered to be entitled to his information, for if he is, the seller is not unfairly discriminated against. The author regards the classical entrepreneur as an essential actor in our economic system and as the creator of what we call insider information. As its creator he is entitled to benefit from the information by trading. It is not easy to separate true entrepreneurs from lucky recipients of windfall information, however, especially in large corporations. Insiders with information cannot be called entrepreneurs simply as a matter of definition. Yet only government employees are clearly identified by Manne as non-entrepreneurs, to be denied any gain from inside information.

Professor Manne argues further that the entrepreneur can be satisfactorily compensated only by insider trading. He criticizes stock options and bonuses because one man's contributions might help an otherwise declining company yet options would not be valuable and bonuses would not be granted. Options might still be granted at a low enough price to give them value, however, and bonus payments for special contributions are conceivable. Moreover, insider trading will not escape these problems either, for a large company's stock can decline despite valuable contributions by one entrepreneur.

Although these entrepreneurial reward arguments may be disputed, Manne's main point still stands. Only a small fraction of stockholders is harmed by insider trading and the practice need not interfere with efficient allocation of capital. To be sure, individuals' incomes may be better related to their economic contributions when insider trading is denied, especially if that also makes fraudulent manipulative abuses more difficult. But effective denial is costly. Professor Manne has opened a constructive discussion of the difficulties and advantages of preventing insider trading. More discussion should follow, not only to settle some of the issues he has raised, but also to suggest new institutional arrangements that might reduce possible abuses of insider trading.

## BIBLIOGRAPHY OF RECENT WORKS IN NON-MARKET DECISION MAKING

By

Mark V. Pauly

The following bibliography covers works in non-market decision making and related fields. Coverage of the period 1963 to mid-1966 is complete, or at least as complete as possible in such a rapidly growing field. Coverage for the period before 1963 is selective, intended to supplement an earlier bibliography prepared by Mr. Charles Plott and available from the editor.

Any classification scheme is somewhat arbitrary, and some works could have been included in more than one section. The scheme used here is organized as follows: The first section lists works of direct relevance to non-market decision making proper. Second are related works in economics, especially in welfare economics and public finance. The third section presents related works in game theory, and the fourth those in political science. Finally, a few relevant works in philosophy, social psychology, and other fields not already included are listed.

References to articles in Papers on Non-Market Decision Making in the bibliography are to those in the first volume of this series. It is expected that future issues of Papers on Non-Market Decision Making will contain a list of new articles in the area, and so will supplement this bibliography.

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